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Stimulating Work in House Wiring

In the older sections of the country there is a total of unwired buildings which seems amazing to the central-station man from the Middle or Far West, where a residence, store or factory is provided with interior wiring as logically as with plumbing. As pointed out in a paper before the New England Section of the National Electric Light Association in convention this week, 160,000 unwired houses await the efforts of the sales department of the Boston Edison company alone; and it is interesting to note that this business is now being sought systematically by a squad of seasoned solicitors. The company is not without experience in canvassing for this class of load and has the hearty co-operation of the electrical contractors in its territory, so that it will not be surprising if records already established are greatly surpassed. For the purpose of acquiring the business readily, the central station has established unit prices acceptable to contractors and has guaranteed to provide the money for the installations and to accept payment in instalments. As a result of this willingness to float its treasury upon the financial bus, the Boston company now has 200 contractors actively co-operating with it, and the plan of extra compensation for outlets secured by the contractor himself is working out admirably. That the consumers will not balk at the cost of interior wiring when the burden is lightened by instalment payments is evident from the fact that the average outlay on 918 contracts was $83. The article on "Handling the Small Consumer in Europe" published in these columns on May 23, although not applicable in its entirety to American conditions, nevertheless gave a clear insight into the possibilities of house-wiring campaigns among the very poorest. The Boston Edison company shows what can be done in a typical American city without even approaching the irreducible limit of cost. If more lighting companies manifested the same enterprise, the industry would be greatly benefited.

Life and Liberty for Industry

If great problems arise small differences lose significance. When the nation is attacked all parties unite in its defence. As it is with nations so it is with families. When a common enemy arises the disputes in families end. At the moment when the banking integrity of this country was threatened the treasury officials in Washington forgot their previous unwillingness to treat with New York bankers; all interests contributed judgment and advice to overcome peril. That was a month ago. It is still a time when the sober judgment and integrity of the nation need to co-operate to protect American industry. The commercial life of the nation is a large part of the life, the health and the prosperity of its people. Our political structure has given the authorities an increasing amount of power to question the basis of commercial life. We have commissions, departments and bureaus galore. The extent of their activities grows always larger, never smaller. They start gradually, they accelerate rapidly, and unless they are directed by uncommon good sense and moderation they soon become autocratic. As autocrats in a democracy they are out of place. Any man can attack a corporation; few can take up its affairs so constructively as to lead it to better things. The standard that the business of this country demands to-day in public office is that which is able to protect and build up commerce. If the voters do not vociferously demand that standard, the economic conditions of the country do. If the terrible European war has no other effect on this nation, may it bring office holders and business men together to co-operate in the sane end of life and liberty for industry.

Advances in Railroad Rates

Advances in mileage book rates, now being announced by Eastern railroads, follow the suggestion of the Interstate Commerce Commission that passenger fares need readjustment. The suggestion of the commission was contained in the decision in the rate-advance case. The commission was unready or unwilling to permit the roads to make the freight-rate advances desired, but it was perfectly ready and willing to hint at increases in passenger fares as one of the means of providing more revenue. Its discussion on this point appears to apply mainly to Central States in which 2-cent-a-mile laws exist. The removal of statutory obstacles of that serious character is not a task in which success could be won except after long effort. The commission made itself subject to criticism by refusing the full advance in cases over which it had jurisdiction and by suggesting that the carriers try to make advances in rates determined largely by intrastate laws over which it had no jurisdiction. There is an element of politics here which the commission cannot be so blind as not to see. In appearance the passenger rate is a direct tax on the public and is therefore subject to political attack. So far as the great body of the public is concerned, the freight rate is an indirect tax. It is far easier to levy an indirect tax than a direct tax. Experiences of governments with taxation prove that this is so. The roads being admittedly in need of more

revenue, it is more important that they be permitted to have it than that an exact distribution of it between freight and passenger business be sought. If every regulating body should refuse to grant increases where it has authority and should suggest that the complaining public utility try to find a more friendly giver in another quarter, the hope of more advances would be dimmed to the point of extinction.

Wireless Telegraphy in Aviation

A vivid idea of the activity which has been displayed, particularly in Germany, in the adaptation of wireless telegraphy to aviation, including sending and receiving apparatus and devices intended to facilitate position finding, is contained in an article referred to in last week's Digest. The importance of these matters from a military standpoint is obvious, especially in the case of dirigibles, which have a fairly long radius of action. This radius in recent airships amounts to several hundred miles, and consequently wireless apparatus of considerable power has to be installed to insure efficient communication between the ship and her base. The problem of adequate antennas is, of course, easily solved on a dirigible, the length of which is sufficient to provide plenty of room, and, indeed, there is no difficulty in getting a reasonable amount of power in the apparatus because of the great carrying capacity of this type of airship. For obvious reasons not very much information is given about the actual details of equipment as applied to military balloons. There is no doubt, however, that light generating sets are in existence which are quite capable of sending wireless dispatches over long distances if not interfered with. A daylight working range of 200 km is claimed for some of the German sets weighing scarcely over 50 lb. More than this can, of course, be reached with apparatus of a weight easily transportable in an airship, and several times this range might conceivably be at times necessary.

It must be admitted, however, that airship equipments of even this power would be very susceptible to "jamming" if operating far from their base. In a military sense, however, it is likely that most valuable scouting work will be done at inconsiderable distances over which wireless conditions would remain fairly good. As to position finding with long horizontal receiving antennas, it is possible, as the article before us indicates, to get considerable information from a properly organized system of sending stations. Inasmuch as flights at great height are not likely to be attempted by this class of flying craft, the present opportunities for successfully applying "wireless" to position finding seem to be somewhat limited. More interesting technically are the possibilities of wireless installations on aeroplanes. Material headway has been made, too, in this branch of the subject, but the somewhat limited size of the sending apparatus and the difficulty of carrying suitable antennas complicate the situation. Various methods of installing antennas have been tried, the favorite one appearing to be a trailing bronze wire carried clear of possible interference with the propellers. A range of sending and receiving distance in the neighborhood of from 50 km to 100 km has been experimentally reached with equipment of practicable weight. As to the particular character of sending and receiving apparatus used, it is apparent that all the familiar equipment has been tried, the differences from ordinary practice being merely such as are consequent on the necessary reduction of weight and bulk. It would be exceedingly interesting to know how far, if at all, wireless communication has been tried on the present scene of hostilities; but the beautifully effective suppression of all ordinary sources of information leaves us quite in the dark as to the actual practice of aerial scouting in this respect. The time gained in sending home reports of observations by wireless telegraphy would evidently be worth something, let alone the possibility of receiving in this way messages from airships which might be unable to get home.

Comparison of Silver and Iodine Voltameter

The voltameter is a well-known piece of electrochemical apparatus, derived from the researches of Faraday, who discovered that a unit quantity of electricity passing through an electrolytic cell effected a definite chemical transfer proportional to the atomic weight of the element so transferred. From this law it followed that the quantity of electricity which passed through an electrolytic cell could be determined by finding the amount of some simple elementary substance transferred therein. The earliest form of Faraday's voltameter consisted of a pair of inverted graduated test tubes supported in dilute sulphuric acid over a pair of platinum electrodes. The volume of the gas collected in this way enabled the total quantity of electricity passed through the cell to be read off by inspection. However, such gas voltameters are liable to appreciable error, owing to the solubility of the liberated gas in the solution where it is formed; but when the substance transferred is a metallic solid, such as copper or silver, the transfer can be determined with great precision. The silver voltameter is, in fact, the internationally adopted means of measuring the international ampere, and, with the aid of a conventional technique, one international coulomb, or ampere-second, of electricity is that which will deposit 1.118 millograms of silver.

The copper voltameter has been employed to a considerable extent, especially in calibrating ammeters and wattmeters, but with a lesser degree of precision than that obtained with the silver voltameter, owing to secondary oxidation of the copper deposit. The zinc voltameter was extensively used by Edison during the early days of electric lighting, as a commercial ampere-hour meter. Experiments have been made with an iodine voltameter for scientific purposes, as a check on the silver voltameter. The care and skill required in order to secure accurate measurements seem to be at least as great with the iodine voltameter as with the silver volt-

ameter, but the latter in careful hands will, it is claimed, give results reproducible to one or two parts in 100,000.

In the last *Bulletin* of the Bureau of Standards is a paper by Messrs. G. W. Vinal and S. J. Bates on a comparison of the silver and iodine voltameter. The agreement which exists between the two is stated to be very close, and the discrepancy may be attributed to an error in the accepted atomic weight of iodine or to errors of observation and chemical impurities. Taking the international coulomb as depositing 1.1180 milligrams, and the atomic weights of silver and iodine as 107.88 and 126.92 respectively, according to recent international agreement, the coulombs per milligram of monatomic substance and unit atomic weight come out 96.515 from the iodine voltameter, against 96.494 from the silver voltameter, a difference of one part in 5000. The value recommended for this constant is 96.50. Such researches are valuable as providing checks on the silver voltameter and in extending our knowledge of quantitative electrochemistry, as well as verifying Faraday's law, but it is fortunate that the engineer does not have to make such elaborate measurements himself. The Weston cell is all that is necessary for his purpose as a standard, when used in connection with the potentiometer.

Financing in War-Time Markets

The cost of temporary financing for central stations is necessarily affected by the demoralization of investment conditions. In the gravely altered state of the market temporary financing, however, is of less concern to companies than the cost of long-time financing. With temporary financing the burden of abnormally heavy cost lasts for only the life of the short-time notes, usually not over a year or two; in long-time, or so-called permanent, financing it is a fixed charge for the life of the bonds, which run seldom less than twenty years and generally longer. A company which has to borrow money during the present acute financial conditions expects to pay a rate measured by those unusual conditions; but when it puts out long-time bonds in the brighter days of its career it tries so to regulate the conditions of sale that it shall get a high price and its securities shall reach permanent investors. The short-time borrower gives a security that invites the banks, which like the promise of early payment; but the seller of long-time bonds seeks his final market in the buyer who puts his securities in the vault and prefers not to disturb them until maturity. The short-time borrower pays substantially the going rate quoted on commercial paper, and when the cost of commission and examination is added to this figure it sometimes makes a staggering price. The strongest borrowers avoid the heavy costs of repeated short-time loans.

Needy corporate borrowers are now confronted by the disturbance or temporary absence of an investors' market, and they turn to the banks for funds and pay the rates demanded. When the New York Stock Exchange suspended trading the leading outside bond houses followed. Except at the quoted prices prevailing before the war trading was stopped. Since bargain hunters have been few and buyers at normal prices have temporarily withheld funds, trading is still too quiet to be worth the name. Before war chilled all financial markets bonds here had shown signs of long-awaited improvement. Buying was freer and bond houses had begun to prepare for the return of active trading for which they had longingly looked. Money was available for loans with which to carry bonds at low rates. Whether or not these favoring influences would have generated the bounding activity which both dealers and borrowing companies wanted the effect of war upon the world's finances has now made it idle to speculate. In place of eager buyers and reluctant sellers there have not been even eager sellers and reluctant buyers.

If there had been trading in the days just following the signs of incipient panic on the Stock Exchange, it would have demoralized prices, sellers and buyers, and made a return to reasonable conditions far more difficult. It would have let the outside bond market be depressed by the frantic liquidation which made the closing of the Stock Exchange necessary. So long as the bond dealers could not sell they refused to buy, waiting until they could again test the power of investors to absorb securities, find whether it had been seriously crippled or was potentially strong, and make their purchases accordingly. Their business is to buy what they can sell, and if the prices at which they buy are out of range with the prices at which they can sell to investors they cannot do business at a profit.

Before a company can safely or wisely lay down a plan of financing probabilities and possibilities which obscure the markets must give way to facts. When the banking situation is safe and normal active trading in securities will be resumed. When free trading is resumed the altered selling values of securities will be plain. Upon this information as a basis new financing plans may be completed. There will be a flood of needy corporate borrowers. Their ranks will be increased by needy municipal borrowers. Europe will not buy our securities until it has restored some of its terrible losses and put its industries again on the road to activity and prosperity. Its own need of capital will be so distressing that it will in fact sell our securities. Therefore Europe is not likely to furnish an immediate good market for the securities of American companies. Whether or not it will do so until the lapse of months, perhaps years, has repaired the waste only time can tell. Companies whose stocks and bonds are held mainly in this country will find protection in that fact. Except as the level of the entire market may be borne downward they will not see their securities suffer from European liquidation. They will, of course, have to take chances on the future of the money market. There appears to be no reason to count on anything less than a future world-wide demand for American funds at rates that will operate to increase the cost of capital for every class of borrowers.

The News of the Week

**Activities and Events in the Electrical Field—
Reports of Meetings—Commission Findings, Etc.**

Adamson Bill Passed in House

Although the Adamson bill passed the House with the amendment of the Pinchot people requiring all water-power companies obtaining rights to build dams to pay a tax, Chairman Adamson of the interstate and foreign commerce committee is firmly of the opinion that the Senate will not accept the amendment. The wording of the amendment is as follows:

"The Secretary of War may provide, as a condition of such approval, for the payment to the United States of reasonable charges for the benefits that accrue to the grantee by the authority given under this act, and at the end of twenty years and every ten years thereafter the Secretary of War may readjust the annual charges as may then be just and reasonable."

The House adopted this amendment after one of the warmest fights seen this session, declining to follow the lead of the chairman of the committee which reported the bill. Chairman Adamson states that only a handful of senators will support the Sherley amendment and that when the bill is enacted the law will contain no reference to taxing companies for horse-power obtained under the act.

The Ferris bill has been passed by the House.

Meeting of Executive Committee, Commercial Section, N. E. L. A.

The first meeting of the new administration executive committee of the Commercial Section of the National Electric Light Association was held at Association Island, N. Y., on Aug. 28. In addition to the chairman, Mr. E. L. Callahan, of Chicago, the following members of the committee were present: Messrs. F. D. Beardslee, St. Louis; J. F. Becker, H. N. McConnell, New York; N. H. Boynton, Cleveland; Douglass Burnett, Baltimore; F. H. Gale, Schenectady; J. D. Israel, Philadelphia; T. I. Jones, George Weiderman, Brooklyn; J. C. McQuiston, Pittsburgh; L. R. Wallis, Boston; C. A. Littlefield, secretary, New York; Miss Burkhalter, assistant secretary, New York.

Mr. Russell, chairman of last year's "Salesman's Handbook" committee, reported that the sections of the handbook on electric elevators and the heating section are being printed, also additional sheets for the power section.

Mr. George B. Muth, of the Philadelphia Electric Company, was appointed to represent the section at the meeting of the Pennsylvania Electric Association at Eagle's Mere, Sept. 8, 9 and 10, and Mr. E. C. Kimball, of the Boston Edison company, to represent the Commercial Section at the New England Section convention at Narragansett Pier, Sept. 2, 3 and 4.

In addition to the regular standing committees, appointed from year to year—finance, publications, handbook and membership—the committee decided to appoint this year, subject to the approval of President Scott, the following: Committees on wiring of existing buildings, education of salesmen, merchandising and recent development of energy-consuming devices; power committee, covering electric furnaces, ice making and refrigeration, pumping and irrigation, mill industries, electricity in mines, logging, electric farming; committee on commercial department terminology, committee on foreign relations.

Cleveland I. E. S. Convention Plans

Seven papers and two lectures have been added to the program of the Cleveland convention of the Illuminating Engineering Society since the notice of that meeting was published in the *Electrical World* of Aug. 22. The papers added are "Self-Contained Portable Electrical Lamps for Mines," by Mr. H. H. Clark; "Factory Lighting: Cost, Maintenance and Installation Data," by Messrs. O. R. Hogue and A. O. Dicker; "The Visibility of Radiation," by Mr. P. G. Nutting; "Recent Improvements in Incandescent Gas Lighting," by Mr. R. F. Pierce; "Further Experiments on the Efficiency of the Eye Under Different Conditions of Lighting," by Messrs. C. E. Ferree and G. Rand; "Characteristic Equations of Tungsten-Filament Lamps and Their Application in Meterochromatic Photometry," by Messrs. G. W. Middlekauff and J. F. Stogland, and "Diffusing Glass for Translucent Ceiling Lighting," by Mr. E. J. Edwards. The lectures will be on "Color Photography," by Mr. M. C. Rypinski, and on "Photo-Sculpturing and the Use of Light in the Reproduction and Illumination of Sculpture," by Mr. Smith J. Hammond. Two papers have been withdrawn from the program, one on "The Lighting of a Carpet Mill," by Messrs. Rose and Oakley, and the other entitled "Effect of Room Dimensions on Efficiency of Lighting Systems," by Mr. Ward Harrison.

New England Electrical Contractors' Convention

The annual convention of the New England Section of the National Electrical Contractors' Association is to be held at Worcester, Mass., Sept. 23 and 24, with headquarters at the Hotel Bancroft.

Following the first day's open session, the second day's papers and addresses will deal with the subjects of relations between contractors, central-station cooperation, relations between jobbers and contractors, relation of manufacturers to the trade, the National Electrical Code, keeping of accounts, and overhead expense. Mr. Henry D. Temple, Worcester, is secretary of the New England branch.

Among the speakers will be Messrs. John R. Galloway, of Washington, president of the National Electrical Contractors' Association; George H. Duffield, of Utica, N. Y., secretary of the National association; James R. Strong, of New York City, a member of the executive committee of the National association; C. C. Wells, of Middleboro, Vt., president of the New England Section, and J. M. Wakeman, of New York, general manager of the Society for Electrical Development.

The committee in charge of arrangements for the convention is composed of Messrs. H. W. Kimball, of Haverhill; Henry D. Temple, of Worcester; W. K. Tuohey, of Springfield; H. Andrews, of Brockton, and A. J. Hixon, of Boston.

Indianapolis Street-Lighting Controversy

More than local attention has been attracted by the recent street-lighting contract between the city of Indianapolis and the Merchants' Heat & Light Company, owing to the low rate named—$41.98 per year for 10-amp alternating-current flame arc lamps, including installation, operation and maintenance—and various complications.

What the Contract Requires

The contract covers a term of ten years beginning at noon on April 1, 1915. By its terms the Merchants' Heat & Light Company agrees to furnish lamps, posts, conduits, wires and accessories, and to operate and maintain them, in such streets and public places as the Board of Public Works of the city of Indianapolis may direct. The number of arc lamps shall not be less than 2000 at any one time and the number of incandescent lamps for ornamental lighting shall not be less than 500. If the lighting system is not in operation by the time specified, the company shall pay the city $500 a day for each day the lighting is not performed. The lighting is for every night from one-half hour after sunset until one-half hour before sunrise. The city's inspectors, supervising the opening of streets, location of poles, etc., shall be paid by the company at the rate of $75 a month. During the life of the contract the company shall adopt all improvements in the art as ordered by the Board of Public Works, provided the changes are reasonable. The prices specified in the contract are as follows:

The Prices as Given in the Contract

For each series 10-amp alternating-current inclosed-flame carbon arc lamp, $41.98 per year for all-night and every-night schedule. Not less than 445 watts must be consumed between the terminals of each lamp.

For each 100-watt series tungsten incandescent lamp, except as specified for certain lamps in "underground district," $17.83 per year for all-night and every-night schedule.

For each 100-watt series tungsten incandescent lamp used as the top lamp of a three-lamp or five-lamp cluster, $8.92 per year for all-night and every-night schedule.

For Meridian Street and underground district series tungsten incandescent lamps as follows: (1) Single 100-watt tungsten lamps on standard, $27.71; (2) clusters of three 100-watt tungsten lamps, $40.35 per cluster; (3) clusters of one 100-watt tungsten lamp and four 60-watt tungsten lamps, $45.18 per cluster. All prices are per year for all-night and every-night schedule.

For electrical energy furnished to City Hall and public buildings, 1.95 cents per kw-hr.

Five per cent of the company's receipts under the contract shall be paid back annually to the city. A deduction of 5 per cent from $41.98, the price per arc lamp, leaves a net price of $39.88.

The specifications on which the contract is based were drawn by Mr. B. J. T. Jeup, city civil engineer.

What Followed the Awarding of the Contract

But the award of the contract by the city to the Merchants' company did not end the matter. A suit was brought by Mr. Herbert H. Rice, a taxpayer, against the city and the Merchants' Heat & Light Company alleging that the Public Service Commission of Indiana has exclusive control over that company in the matter of rates and that neither the municipality nor the defendant company has the right to enter into such a contract. Further, the rates fixed in the contract were alleged to be discriminatory in favor of the municipality and against the plaintiff and other consumers. The judge held that the municipality had the right to make the contract except as to the rates. From this decision an appeal was taken to the Supreme Court, and this appeal is still pending.

Case Taken to Public Service Commission

Meanwhile the Indianapolis Light & Heat Company petitioned the Public Service Commission of Indiana to take up the matter and investigate the street-lighting contract. A hearing by the commission has been set for Sept. 14. The Indianapolis company contends that it is not right for a newer company to duplicate the investment in its street-lighting plant and ask a return on this duplication. Further, officers of the Indianapolis company say that the price named in the new contract is so low that the business must be taken at a loss; in fact, there is a question whether their bid of $60 is profitable. In other cities, they say, lamps taking from 425 watts to 500 watts and burning in the neighborhood of 4000 hours per year cost from $56 (Buffalo) to $124 (Brookline, Mass.) a year.

The Merchants' company is going ahead with its construction work for a new street-lighting system. When President Harrison was asked by an *Electrical World* man if it was true that the contract was taken at a loss he said: "We are doing business on business principles. We have excellent reasons for making the price we have made." Then, with considerable vehemence, "We have had to contend with a pretty raw political game."

Mayor Bell says the position of the city administration is that under the law the city has a right to enter into contract with a competing company; that the contract is a valid contract, and that the Public Service Commission has the right only to reduce the rate if found too high.

Old-House Wiring and Special Campaigns

Mr. E. C. Kimball, of the Boston Edison company, presented a suggestive paper before the New England Section of the National Electric Light Association at Narragansett Pier this week in which the results of his company's wiring campaign during the past nine months were set forth. He outlined the maze of uncertainties which the average householder enters in trying to analyze competitive bids and recommendations by rival contractors, and pointed out the importance of steadying such development by central-station cooperation. In the long run the mere financing of a wiring plan is but equivalent to an acceptance of a customer's note with monthly payments to be matured within a stated period. There is not a company in the association which could not well afford to adopt such a plan and waive the interest charges on a wiring proposition as offset by the income possibilities.

In the nine months ended July 31, 1914, the company signed 918 contracts, adding 17,000 50-watt equivalents to the connected load. The estimated income from this business is $21,000. House wiring as contracted for under the plan amounts to $75,800, of which the Edison company has received in cash payments $7,700, leaving a difference of about $68,000 to be paid monthly, amounting on Aug. 1 to $4,485 per month, so that the company's financial investment in the proposition will be entirely cared for within fifteen months and the real investment will be but the interest rate on $6,800 for seven and one-half months. In other words, the company will expend but $2,100 to secure a net increase in income of $21,000 per annum. There are 160,000 unwired houses in the company's territory, so that the prospects are excellent for increased business. The

author outlined the plan of campaign, which was described in the *Electrical World* of Nov. 15, 1913, page 1013, and stated that, although some opposition at first developed from the contractors, there are now 200 contractors who are accepting such work as the company may turn over, and many who call daily to find out if more work cannot be had. The company arbitrarily set the price at which the work should be done, but in making up its price list it consulted a competent contractor, whose consent the company obtained to execute any contract which might be secured at the prices quoted, before putting the proposition to the contractors as a whole. Much co-operation has been obtained from the contractors by means of a plan whereby the company pays the contractor $2 per customer plus 25 cents per outlet installed. Under this plan the company has secured from the contractors 248 contracts, for which it has paid in compensation $1,265.25, or an average of about $5.10 per house secured and wired by the contractor. This has been divided among fifty contractors.

The proposition consists fundamentally in wiring one outlet, with service installation, meter board, fuse plugs, etc., in armored cable on any first-floor location in a house except the ceiling for a price of $14.35, payable $2.35 down and $2 per month. The effectiveness of this plan is indicated by the fact that but twenty-nine out of the 918 contracts signed were for the minimum amount of $14.35. The tabulation of contract ranges is given herewith. The average contract has amounted to about $83.

BOSTON EDISON HOUSE-WIRING CAMPAIGN RESULTS

No. of Contracts	Range in Amounts
38	$14.35 to $25.00
146	25.00 to 50.00
231	50.00 to 75.00
227	75.00 to 100.00
196	100.00 to 150.00
37	150.00 to 200.00
14	Over 200.00

Store-Wiring Campaign

Considerable success has also been attained in a store-wiring campaign where the company has agreed to furnish a tungsten fixture for a minimum of 150 watts for outside lighting and 100 watts inside. The former is an ordinary spun-brass canopy with stem and chain fitted with Holophane prismatic glass. In addition to furnishing the fixtures, the company finances the wiring and has adopted the following schedule as a basis of wiring:

Five outlets	$17.50
Four outlets	15.50
Three outlets	13.50
Additional outlets over five, each	2.50

Since the beginning of this campaign in December, 1913, the company has signed on a financing basis 946 contracts, totaling 13,933 50-watt equivalents, with a gross income of about $50,000. The contracted price for the wiring totaled $20,500, of which $3,100 has been paid down, and from which the company is receiving $1,800 monthly payments. Outside of the financing agreement, many of these fixtures have been installed in places where the user had a meter but was burning mainly gas. In so doing the company has changed actual conditions of use, and the customer is now using electricity, carrying gas as an auxiliary service. Very few of the customers use the fixtures solely as a part of the decorative scheme by continuing to burn gas to the exclusion of electricity. A large class of small shopkeepers is being educated in the use of electricity, the cost of which is reasonable with the present equipment and rates. Up to Aug. 1 the total number of tungsten fixtures installed for outside service was 1027 and the number of interior fixtures 8771.

At present the company is starting in the field one of its agents, who secured the greatest number of contracts under the plan of district agent, and has transferred him to the suburban territory with a corps of men who will make an intensive canvass of each town on the system. By this plan, when the agent starts in a town the house-wiring campaign will be confined entirely to this squad of special solicitors, and any work which the district agent may have under that plan will be in charge of the special agent.

California Commission's Rules on Inductive Interference

The California Railroad Commission has just issued its general order No. 39, dealing with the construction and operation of electric distribution systems and communication circuits which are, or are intended to be, so located as to create inductive interference. The order is based on the report of the joint committee on inductive interference, which is made up of the chief engineers of the principal telephone, telegraph, electric and railway companies, for the utilities, and the engineers of the California Railroad Commission, for the public. Investigations in the field, in the laboratory and in the office began December, 1912, and have been carried on very actively by the committee and its staff ever since that time. The principal part of the investigation has been completed, and the report of the committee covers several hundred pages with a mass of diagrams, photographs and mathematical computations treating the subject exhaustively.

The following definitions are given of certain technical terms employed:

Power Circuit. The term "power circuit" includes any overhead constant-potential alternating-current power transmission or distribution circuit or electrically connected network which has a voltage of 5000 volts or more between any two conductors or of 3000 volts or more between any conductor and ground.

Communication Circuit. The term "communication circuit" includes any overhead, open-wire telephone, telegraph or signaling circuit which is used in the service of the public.

Telephone Circuit. The term "telephone circuit" includes any inter-exchange metallic telephone circuit, and therefore excludes subscribers' circuits. This term also includes any metallic telephone circuit operated by any railroad or other company for dispatching purposes or for public use between separate communities.

Line. The term "line" means any circuit or aggregation of circuits carried on poles or towers.

Parallel or Parallelism. The terms "parallel" and "parallelism" refer to cases where a power line and a communication line follow substantially the same course, or are otherwise in proximity for a sufficient distance, so that the power circuit is liable to create inductive interference in the communication circuits.

Residual Current. The term "residual current" denotes the vector sum of the currents in the several conductors of a power circuit.

Residual Voltage. The term "residual voltage" denotes the vector sum of the voltages to ground of the several conductors of a power circuit.

Transposition. The term "transposition" denotes the interchange of position of the several conductors of a circuit.

The rules promulgated by the commission are as follows:

I. Avoidance of Parallelism

Every reasonable effort shall be made to avoid new parallelism. The party proposing to build a new communication or power line which will create a parallel, or generally to reconstruct an existing line involved in a parallel, shall give due notice (at least thirty days wherever possible) of its intention to the other party, including detailed information as to the location and character of the proposed line. If a plan can be devised and agreed upon by the two parties for maintaining an adequate separation between the two classes of lines so as to avoid interference, this shall be done. In case it is impracticable to secure adequate separation between a power line and a communication line, parallelism will be permitted subject to the conditions set forth in II.

II. Condition Under Which Parallelism Will Be Permitted

(a) *Minimum Horizontal Separation.* The minimum horizontal separation between the power line and communication line shall be equal to the height of the taller line. The only exceptions to this provision are angle crossings and other unavoidable cases of close proximity, and in all such cases the power line shall be kept above the communication line and constructed in conformity with the National Electric Light Association's specifications for overhead crossings or other approved equivalent which may be agreed upon by both companies.

(b) *Balance of Power System.* The power company shall exercise due diligence to keep the currents in, and the voltages to ground of, the conductors of any power circuit involved in a parallel as closely balanced as practicable. In all cases where telephone circuits are involved special consideration shall be given to the prevention or elimination of harmonics in the residual current and in the residual voltage.

(c) *Limitation of Residual Currents and Voltages.* Pending additional rules on specific means other than those given herein, the parties concerned shall endeavor to agree upon the means to be employed for the prevention or limitation of residual currents and voltages, and in the event of disagreement the matter shall be referred to the Railroad Commission of the State of California.

(d) *Transpositions Inside Limits of Parallel.* An adequate system of transpositions shall be installed in the power circuit (or circuits) and in the communication circuit (or circuits), provided the latter is metallic. When both circuits are transposed the transpositions in both the communication and power circuits shall be located with due regard to each other.

Every reasonable effort shall be made by both parties concerned to fix the limits of the parallel and the location of crossings, branch lines and connected apparatus so as to facilitate the application of an effective transposition scheme.

In the case of a parallel between a power line and a telephone line the company owning or operating the telephone line involved shall have the right to specify the number, type (in respect to electrical characteristics) and location of the transpositions in the power circuit subject to the following limitations:

(1) For power circuits of 50,000 volts or over the average distance between successive transpositions shall not be required to be less than 1 mile, and the minimum distance between any two successive transpositions shall not be required to be less than two-thirds of a mile.

(2) For power circuits of less than 50,000 volts the distance between successive transpositions shall not be required to be less than one-sixth mile.

The transposition system of the telephone circuits shall be modified where necessary in order that the power and telephone circuits shall be, as nearly as practicable, mutually non-inductive.

For short parallels less than 6 miles in length (or short sections of longer parallels which have to be treated independently because of abrupt change in conditions) with power circuits of 50,000 volts or over, where it is impracticable to obtain an adequate balance by the location of transpositions in accordance with the limit specified above, the company owning or operating the telephone line involved shall have the right to specify the number, type and location of transpositions, provided the distance specified between successive transpositions is not less than ½ mile.

When necessary (owing to variations in lengths of telephone transposition sections) in order to secure an adequate balance, a reduction of 10 per cent in the limiting distance between successive power circuit transpositions as given above shall be allowed.

In the case of a parallel between a power line and a telegraph line or other grounded communication circuit the location of the transpositions in the power line shall be with due regard to the limits of the parallel in order to form as nearly as practicable a balanced system. The location and type of such transposition shall be as specified by the communication company, subject to the condition that the transpositions in the power circuit may not be required to be less than 1 mile apart.

In no case shall the power company be required to relocate poles or towers for the transpositions.

The parties concerned in any proposed parallel shall endeavor to agree upon a transposition scheme for such parallel in accordance with the above. In the event of a disagreement the matter shall be referred to the Railroad Commission of the State of California.

(e) *Transpositions Outside Limits of Parallel.* In addition to transpositions within the limits of a parallel, as provided in "d" hereof, each new power circuit isolated from ground (or extensions of such existing circuit) which is constructed subsequent to the date when these rules become effective shall be transposed throughout its entire length in such manner as to balance the electrostatic capacities to earth of its several conductors, so as to avoid inequalities among the voltages to earth of the several conductors, which would create inductive interference. Such transpositions shall not be more than 8 miles apart, provided, however, that circuits less than 3 miles in length are not required to be transposed until they are extended to a greater length; except that extensions or spurs from existing lines the electrostatic capacities to earth of whose conductors are balanced shall be so constructed as not to change materially the balance of the existing lines to which they are connected.

(f) *Uniformity of Parallel.* To facilitate the application of effective transpositions, both parties shall endeavor to maintain uniform separation, uniform arrangement of conductors and uniform relative location of the two classes of circuits within the limits of a parallel. However, when it is feasible to secure a substantial increase of separation between the two lines for a considerable portion of a parallel this shall be done, as such an increase of separation is of more benefit than uniformity.

(g) *Transformer Connections.* (1) On any power circuit involved in a parallel no grounded single-phase or grounded open-star transformer connections shall be employed.* On a power circuit involved in a parallel no star-connected transformers or auto-transformers with grounded neutral shall be employed unless delta-connected secondary or tertiary windings or other equivalent means are used of suppressing the third harmonic

*This does not apply to railroads operating alternating-current trolleys with ground return, which are covered by V.

components of the residual voltages and currents introduced by the transformers. (3) Where single-phase loads are connected to a polyphase power circuit involved in a parallel the power company shall endeavor to arrange successive connections of this type so as to equalize the loads upon the several phases. (4) On a three-phase circuit involved in a parallel the power company shall use, wherever practicable, a closed-delta connection in preference to an open-delta connection, and where the latter is employed an effort shall be made to distribute such connections equally upon the several phases.

(h) *Switch Equipment.* A power circuit involved in a parallel shall be equipped, between the source of supply and the parallel, with oil switches, all poles of which shall be mechanically interconnected for simultaneous action. With the exception of stations where an operator is constantly on duty, these switches shall be rendered automatic for short-circuits, grounds and abnormal neutral currents.

(i) *Switching.* All switching on all parts of a system connected to a circuit involved in a parallel which causes harmful transient disturbances in communication circuits shall be done by means of oil switches, all poles of which are mechanically interconnected for simultaneous operation.

(j) *Use of Air Switches.* The use of air switches on a power circuit involved in a parallel is prohibited except for purposes of isolating sections of dead line or for disconnecting transformers under no load. This applies to the entire power system any circuit of which is involved in a parallel, unless such switching is so remote as not to cause harmful transient disturbances in the communication circuits.

(k) *Abnormal Conditions.* A power circuit involved in a parallel shall not be operated at any time with an open, grounded or short-circuited line wire or wires or transformer winding.

(l) *Devices for Indicating Abnormal Conditions on Systems Isolated from Ground.* If a power circuit involved in a parallel is electrically isolated from ground, reliable indicating devices shall be installed at its source of supply to inform the operator immediately of abnormal conditions, such as grounds, and wherever possible open circuits which have not operated automatic switches. Upon indication of trouble by such devices, the operator shall immediately open the oil switches and proceed in the manner outlined in "m."

(m) *Procedure Under Abnormal Conditions.* In case of the opening of an oil switch owing to an abnormal condition in a power circuit involved in a parallel, or any circuit supplying or supplied by the same, such switch may be closed once. If opened a second time owing to the continuance of the fault of abnormal condition, said switch shall not be closed again until the line has been sectionalized. The fault may then be located by energizing sections of line, provided that further sectionalization of the line be done in such sequence as to cause the minimum disturbance to parallel communication circuits, and provided further that where practicable the faulty section of line shall be energized but once in this process of sectionalization, where the fault exists within or beyond the parallel, until such fault is remedied.

(n) *Ammeters in Neutral Ground Connections.* Wherever a neutral ground connection is employed on a circuit involved in a parallel, an ammeter suitable for measuring as accurately as practicable the current in the neutral under normal operating conditions shall be installed in all neutral connections at the main generating station and substations on the power system electrically connected to the circuit involved in the parallel. The power company shall maintain a record of hourly measurements of the neutral current at all such points.

(o) *Charging Electrolytic Lightning Arresters.* Where a power system is equipped with electrolytic lightning arresters so charged as to cause inductive interference in communication circuits, the method of charging the arresters shall be modified to eliminate the disturbances as far as possible. The charging of such lightning arresters shall be done at such time as to give the minimum liability of interference with communication circuit operation, preferably between the hours of 2 a. m. and 4 a. m.

(p) *Wave Form of Rotating Machines.* The power company shall make every effort to obtain generators and synchronous motors for use on all parts of the system, giving, as nearly as reasonably possible, pure sine waves of voltage at fundamental frequency. In no case shall the deviation from a pure sine wave exceed the limit set forth in the Standardization Rules of the American Institute of Electrical Engineers.

(q) *Exciting Current of Transformers.* In order that the wave shapes of voltage and current may be distorted as little as practicable by transformers, the main line transformers employed on circuits involved in a parallel and on future extensions of such circuits shall have an exciting current as low as is consistent with good practice, and in no case shall the exciting current at rated voltage exceed 10 per cent of the full load current. Such transformers shall not be operated at more than 10 per cent above their rated voltage.

III. Provisions Applying to Existing Parallels

The following sections of II shall apply also to power circuits involved in existing parallels: b, i, j, k, l, m, o, p and q. Also g-3 and g-4 shall apply to existing parallels to the extent that transformers added hereafter shall be connected as provided in said rules.

IV. Waiver of Conditions by Communication Company

At the option of the company operating the communication circuit or circuits any of the provisions of II and III may be waived provided that such waiver does not increase the hazard.

V. Parallelism with Alternating-Current Railways

It is recognized that railroads operating alternating-current trolleys with ground return create serious inductive interference with parallel communication circuits. In the present state of the art no means for completely overcoming inductive interference from such parallels is known, hence they are to be avoided if possible, and where unavoidable the responsibilities arising therefrom must be settled by mutual agreement, or in case of inability to agree the matter shall be referred to the Railroad Commission of the State of California.

VI. Applicability to Past and Future Construction

These rules shall apply to all future construction in this State of the character herein indicated and to all construction now existing, provided that if any party desires to make a departure from these rules as to construction now existing such party may file his written petition with the Railroad Commission, whereupon the commission will take such action as may seem to it proper.

VII. Rules Subject to Laws and Orders of Commission

These rules are to apply in all cases where they are not in conflict with any law of this State or order of this commission now or hereafter in effect. In case of conflict, where these rules add to the requirement of any law of this State or order of this commission, these rules shall prevail, otherwise not.

Domestic and Foreign Business Outlook

Electrical Manufacturers Express Encouraging Views as to Present Situation and Prospects for the Future

FIND BUSINESS CONDITIONS PROMISING

Statements Show that Careful Consideration Is Being Given to Export Trade

In order to get accurate information concerning the condition of business, the *Electrical World* has asked manufacturers in the electrical industry to state their opinions on the outlook. The views of some of the manufacturers follow:

No Adverse Effect

Mr. H. B. Logan, president Dossert & Company, New York: "We do not find that war-time conditions have affected us adversely as yet. We received a good volume of orders during the month of August and have a greater aggregate of unfilled orders on hand now than at any time during the past fifteen months. We are not dependent upon Europe for raw materials; all materials used in our manufacturing are produced in this country. We are unable to estimate the effect of the war on our export business, which is chiefly with countries in the Western Hemisphere. We have not reduced or increased our organization and have taken no extraordinary steps to develop export trade. We do not anticipate any material falling off in the volume of our business in this country."

Mr. E. E. Cary, treasurer Edward E. Cary Company, Inc., New York: "Our present efforts are confined to exporting electrical specialties which we have imported the past fourteen years. Part of our business has been exporting from European ports to various foreign countries, and we are in a most favorable position to take advantage at the present time of our past experience."

Will Care for Carbon Business

Officials of the National Carbon Company, Cleveland, state that preparations are being made to take care of all the carbon business that comes from those countries which have been depending upon Europe for their supplies. That they must look elsewhere for carbons is a foregone conclusion and, without doubt, a demand will be made upon the producers of the United States to meet their needs now. So far as the battery business is concerned, the situation remains unchanged. The company has had a good battery business from almost all foreign countries for some years, and the war can make but little difference with the countries that are not now affected by it.

Satisfied with the Outlook

Mr. E. G. Hatch, manager the Clark Electric & Manufacturing Company, New York: "In normal times our business is about equally divided between domestic and export. For about ten days after war was declared we received very little new business and a few cancellations. We believe the reason for this was, undoubtedly, because the actual declaration of war came very much as a surprise; nine out of every ten people here, up to the last minute, were of the opinion that, although matters looked very bad, no country in Europe would actually take the responsibility of declaring war. When war was actually declared, business men here were more or less stunned and stood aside for the moment to watch results. After about the first ten days our orders began to come in just about as before for this season of the year. Since then we have done a very good business and have been very well satisfied with the general outlook. So far our export business has not been harmed; in fact, with better conditions in Mexico and South America, we have experienced a renewed demand for material from these parts. We do a considerable business direct with Great Britain, which has not been interfered with in the slightest, except during the first few days. As a matter of fact, we have received a number of large inquiries from Great Britain since the war started. As regards the South American trade, the people there are ready to buy our goods, but are largely prevented by the poor understanding as to credit existing between us. Until we have branches of American banks in South America, or until, possibly, the government lends its assistance, only a small proportion of the South American business actually available will be secured here. We find very little new electrical construction work going on, but, as a matter of fact, conditions are no worse now than they have been for some time past. For a year or more it has not been an easy matter to obtain money for new enterprises. We are not dependent in any way on European countries for raw materials. Our organization is just about the same as last year at this time. So far the war has not hurt us in the slightest, and although business would undoubtedly be better were financial matters in better shape, as to the new building lines, we know that these lines will eventually be built and are very well satisfied with the orders we are receiving under the present conditions. A great deal is being said about the wonderful opportunities in South America. Opportunities do exist, but we think these have been slightly overestimated. There are plenty of ships available from ports here for South America now, and those leaving, in most cases, have not a full cargo. South America is just as badly off as regards the financial situation as we ourselves, or a little worse. Although it needs material, it has not the ready cash to pay for it."

Export Association to Be Active

Mr. W. N. Dickinson, General Elevator Company, New York: "We are all most anxious to obtain a correct perspective regarding the results accruing from the tremendous events which are occurring at the moment, and each should do his part in assisting toward this end. While I spent nine months of last year in European and South American countries, I am not at all clear concerning the ultimate situation, although I find that certain views are commencing to shape themselves more clearly in my mind. It is not, however, the opinion of any one man which is of particular value at this time, as we are all apt to be influenced by the conditions familiar to ourselves. The American manufacturers who are interested in the export trade have an association known as the American Manufacturers' Export Association, with offices at 66 Broadway, New York City. The directors of this association have conscientiously endeavored to arrive at some common view concerning the important questions regarding which you are seeking information. While they have gone some distance in reaching general conclusions and have taken steps regarding the dissemination of authentic information as to points on which such information is obtainable, they have decided that a general discussion

between men who are actually handling the export business of a number of manufacturing companies would be the best method of arriving at a consensus of opinion which would be of real value and they have arranged for a luncheon at which such discussion will take place on Sept. 18. Some of the well-known manufacturers of electrical apparatus and material are members of this association."

BANKS AND CREDIT IN SOUTH AMERICA

Report Made by Mr. Edward N. Hurley to Department of Commerce Shows Need of American Banking Facilities

A report on banking and credit in South America has been made by Mr. Edward N. Hurley, president of the Hurley Machine Company, of Chicago, to Secretary Redfield of the Department of Commerce. The report was made at the request of Mr. Redfield and is the result of a study of conditions in South America which was undertaken by Mr. Hurley during a trip to South America as chairman of a delegation representing the Illinois Manufacturers' Association. The conclusion of Mr. Hurley is that, although American trade is well established in Argentina, Brazil, Chile and Peru and is growing despite the lack of direct banking facilities, there is an imperative need for American banks as a dependable resource in the campaign for trade.

Foreign and native banking houses reasonably will accommodate the ordinary routine of American trade, Mr. Hurley states, but they naturally withhold the full measure of interest and solicitous support accorded to enterprises of their own nationality. Moreover, many valuable collateral benefits arising from the financing of oversea trade are lost through American reliance upon London banking mediation, while the compulsory use of European materials in many South American enterprises financed in Europe is steadily restricting the potential market for American goods.

The United States pays London annually a large toll in the form of bankers' commissions, but more important is the fact that once an American obligation is converted into a bill on London and slips into foreign financial channels it passes out of the hands of those who might be interested in obtaining return purchases by the selling country, and an obligation that ought to stimulate a demand for products of the United States is transferred to London and exerts an influence toward purchases from the United Kingdom.

Credit Agencies

Since the foreign and native banks in South America are called upon to accept drafts representing credits, they must maintain credit information services, no less for their own protection than for the accommodation of customers. For many years these banks have supplied this need, but mercantile credit agencies have also been established in recent years. Foreign banks supply their home offices with the ratings and characteristics of South American firms and individuals. German trade has been extended largely by the aid of longer credits than are granted by other countries, and German banks have been more minute in their organizations of this service. As South American countries are being developed largely with funds from European countries, information as to the character and standing of persons back of the various enterprises is the first need of those whom they approach abroad, hence foreign banks have become channels through which investments are made in railways, light and power companies, etc.

In recent years the practice of stipulating the use of materials from countries loaning the money for railways, port works, etc., has increased, and this operates to restrict the field for American manufacturers, since American capital does not largely enter the South American field.

Mr. Hurley states that it is obvious that various kinds of banking must be carried on by an institution adapted to assist American trade, for its business, like that of European banks in South America, cannot be limited to strictly commercial banking. Banking services there are intimately connected with loans to governments and cities, with industrial investments, etc., which would not come under the operation of the United States federal reserve act. The conclusion seems correct, therefore, that some of the banking facilities demanded for South American trade may have to be provided by some institutions outside the federal reserve system. Consequently large state banks and trust companies receiving their charters from states are institutions from which assistance may be sought in order that American business men may get the same facilities as the Germans and the English receive from their banks established for the encouragement of foreign trade.

ENGLAND ACTS ON FOREIGN PATENTS

Announcement from Board of Trade on Patents Owned by Subjects of Warring Countries

The London Board of Trade made an announcement on Aug. 22 in regard to patents owned by subjects of countries with which England is at war, as follows:

"The Board of Trade has issued rules under the patents, designs and trade-marks (temporary rules) act, 1914, regulating the procedure for the avoidance or suspension of any patent or license or trade-mark granted the proprietor of which is a subject of any state at war with His Majesty where an application is made to the board for this purpose. The board must be satisfied that the applicant intends to manufacture the article concerned or carry on the patented process, and also that it is in the public interest that this should be done. The rules provide also for the avoidance or suspension of any application for a patent or trade-mark by a subject of an enemy state."

SHIP EXPOSITION FOR SOUTH AMERICA

Illinois Manufacturers' Association Proposes to Send Steamer with Samples of American Machinery and Goods

Under the chairmanship of Mr. E. N. Hurley, of Chicago, the foreign trade committee of the Illinois Manufacturers' Association has been very active in its efforts to expand trade with South America. The association has decided to go ahead with the project of chartering a steamship of about 5000 tons to go to South American ports with samples of American machinery and manufactured goods of all kinds. It is planned to fit up the main deck of the boat and also portions of the hold as an exposition of manufactured products suitable for the South American market. Salesmen, and possibly saleswomen as well, will be on board to explain the exhibits, and it is planned to make stops of perhaps several weeks' duration in the principal South American ports, on the east coast at all events and possibly on the west coast. A particular effort will be made to show the goods of smaller manufacturers, as it is felt that a co-operative effort such as this should appeal particularly to those American producers who have not the great resources of the large manufacturing concerns. Novelties and specialties of all kinds are especially desired. Electrical manufactures are wanted.

PUBLIC SERVICE COMMISSION NEWS

Ohio Commission

In order to be in position to make appraisals as requested by municipalities throughout the State, the Public Utilities Commission has appointed twenty appraisal engineers and ten appraisal clerks. The selections were made from lists certified to the commission by the State Civil Service Commission, before which the applicants took competitive examinations. The salary paid to the new appointees is $125 per month. It is probable that the commission will now be able to make requested appraisals more promptly than in the past.

New York Commissions

The Public Service Commission for the First District has authorized the Edison Electric Illuminating Company of Brooklyn to acquire 122 shares of the capital stock of the Amsterdam Electric Light & Power Company, making it possible for the Edison company to own all of the stock of the Amsterdam company. The order, however, is not to be interpreted as an approval of the merger of the two companies.

At the State Fair in Syracuse, which opened on Aug. 31, the Public Service Commission for the First District has a large exhibit showing the character of its work.

Massachusetts Commission

The Gas and Electric Light Commission has issued a decision refusing the petition of the municipal light board of the town of Wakefield for authority to sell gas at $1.20 per 1000 cu. ft. The town also desired to sell electricity at 12 cents per kw-hr. The commission found that this price did not exceed the cost of production as defined by the statute, but in view of the fact that since the hearing the town has made a contract with the Edison Electric Illuminating Company of Boston for the purchase in the immediate future of all its electricity at a price which should effect some saving in its operating costs, the commission found no occasion for action with respect to the proposed maximum net price. With regard to the existing differentials charged for energy used in motor service and commercial lighting, the commission stated that these rates have been in force for some time, and while they are in many cases less than the average cost as determined by the legally defined method, they have secured an amount of custom which probably otherwise could not have been obtained and which has proved advantageous to the business as a whole. These rates are therefore left unchanged. The commission analyzed the cost of manufacturing gas, including fixed charges, and found that even if depreciation were reckoned at 3 per cent, as is permitted for a different purpose by the Acts of 1906, Chap. 411, and if the maturing debt requirements were omitted, the fixed charges exceed 30 cents per 1000 cu. ft., while the operating costs for the past two and one-half years have averaged $1.08. The average net operating expenses for the past two and one-half years have been $32,700 and the average annual sales 30,129,375 cu. ft. The commission therefore refused to permit the town to establish the desired net price of $1.20 and further states that there is no sufficient reason to believe that a loss so substantial is likely to be absorbed by the increase in output to come from the lower price.

The commission has authorized the Buzzard's Bay Electric Company to supply electricity in the towns of Yarmouth, Dennis, Chatham, Harwich and Mashpee. The company plans to extend its lines into Yarmouth from Hyannis, to install a small plant and distributing system in Chatham, and to extend its transmission line over private right-of-way along the middle of Cape Cod.

Current News Notes

OFFICIALLY ILLUMINATED.—An American, writing from London of his experiences during the sacking of Louvain by the Germans, said that it was always possible to distinguish a German officer after dark by the electric torch he carried strapped to his chest.

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WATER WAS NOT MADE ONLY TO DRINK.—Because of the high price of coal, owing to the fact that the bulk of it is imported, Sweden has come to depend extensively on her water-power for electrical energy. Consul-General Ernest L. Harris writes from Stockholm that 72 per cent of Sweden's towns and cities are lighted by electrical energy derived from waterfalls.

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ELECTRIC MEALS AT POCATELLO, IDAHO.—Passengers over the Oregon Short Line railroad will shortly be served with electrically cooked meals at Pocatello, Idaho, where electric cooking apparatus is being installed in the new station restaurant. All the mixing, baking and cooking in this model kitchen will be done by electricity. If the installation proves as successful as the company's engineers anticipate, the use of electricity will be extended to the railroad's hotel service at many other points on the system.

* * *

FILIPINOS AS LINEMEN.—According to American electrical men in the Orient, the natives of the Philippines make good linemen, even though they may not have very definite ideas of the nature of electricity. They are unafraid without being careless, and willingly use rubber gloves whenever such protection is insisted upon, although at the same time assuring their foremen that their feet, which are calloused, are "all same rubber" for insulation purposes. While converting a 3300-volt transmission line about a mile long from four-pin to six-pin cross-arm construction not a single mishap occurred, although only native linemen were employed and the conductors were energized all the time.

* * *

AN IOWA TRANSMISSION SYSTEM.—The transmission system centering about Clarinda, Ia., which is owned by the Lee Light & Power Company, has been growing for a number of years until now it includes 70 miles of 13,200-volt transmission lines and substations in New Market, Bedford, Gravity, Corning, Blanchard, College Springs, Braddyville and Shambaugh, Iowa, as well as Elmo, Mo. Twenty-four-hour electric service is supplied as well as central-station heating and artificial ice. Mr. Rufus E. Lee, the manager of the Lee Light & Power Company, was also at the head of its predecessor, the Lee Electric Company of Clarinda, and is the president-elect of the Iowa Electrical Association, affiliated with the N. E. L. A.

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ENCOURAGING CANADIAN ELECTRICAL EMPLOYEES TO ENLIST.—To its employees who have enlisted under the British colors the Montreal (Que.) Light, Heat & Power Company makes the announcement that these men will not only be retained in their status as employees as regards the company pension fund and other benefits, but will moreover be allowed the difference in pay between the government rate and the employee's former wages, from date of enlistment to date of discharge or death. If desired, this accrued pay will be sent to the employee's dependents at intervals of two weeks. The present regulation covers the organization

of the first Canadian contingent, but additional orders will be issued in case further Canadian troops are called for.

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AN ILLUMINATED BOX-OFFICE PLAN.—A Waukegan (Ill.) inventor has originated an illuminated auditorium plan for theater box offices, which has each seat represented by a small lamp. By means of contacts under the seats in the theater the corresponding lamp is extinguished when any seat is turned down ready for use, thus showing the box-office clerk and the intending purchaser which seats are available at any time.

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NIAGARA-WINDSOR TRANSMISSION LINE TESTED—The new transmission line of the Hydro-Electric Power Commission of Ontario serving Windsor, Ont., the Canadian city across the Detroit River from Detroit, Mich., has now been tested out and made ready for operation. The line is 250 miles long and is carried on both steel towers and wooden poles. The Windsor line and the Welland line were built by the commission under the supervision of its own engineers. The Welland line will carry 18,000 hp to the factories of that place. A large proportion of this energy will be consumed in the electric furnaces of the local carbide works.

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THE FERTILIZING ACTION OF LIGHTNING DISCHARGES.—At the high temperature of the lightning flash the nitrogen of the air is burned with the oxygen, forming nitric oxides which, dissolved in rain, are precipitated on the earth in the form of weak solutions of nitric acid. In tropical countries where thunder showers are frequent and severe, this nitrogen-fixing phenomenon of the elements has important value in fertilizing the earth. A French geographer estimates, for example, that in the Tonkin delta in Indo-China the amount of atmospheric nitrogen thus obtained annually is equivalent to nearly 200,000 tons of nitrate of soda, or 150,000 tons of ammonium sulphate, worth $20,000,000.

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HOTEL ACCOMMODATIONS, SAN FRANCISCO, 1915.—Visitors to San Francisco during the 1915 convention of the National Electric Light Association, the International Electrical Congress and other important meetings to be held coincidently with the Exposition are promised accommodations in nearly a thousand hotels and apartment houses, most of them fireproof and new. It is estimated that some 60,000 rooms will be thus available, and even this number may be increased to 100,000 before the close of the Exposition. The hotel men of the city have also agreed that there shall be no mutual increase in rates. A hotel bureau has already been organized and has booked about 25,000 reservations to date.

* * *

HOW UNCLE SAM KEEPS EMPLOYEES' PIANOS DRY AT PANAMA.—Employees of the Panama Canal are furnished gratis with electricity for all lamps in the original outlets in their quarters, but must pay extra for energy required for additional lamps or for the operation of heating appliances, etc. An exception is made, however, in the case of extra lamps installed by the electrical division to keep moisture out of pianos. For lamps burned for this purpose no charge is made. Extra lamps for lighting up to 50 watts rating cost 50 cents per month, flat rate, and lamps of from 50 watts to 100 watts rating cost $1 per month. For electrical appliances the monthly charges are as follows: 100 watts or less, 50 cents; 100 to 550 watts, 75 cents; 550 to 1000 watts, $1; 1000 to 1500 watts, $1.50. No charges are made for less than a full month, and bills not paid within fifteen days are increased by 25 per cent, service meanwhile being cut off, not to be resumed without authority of the Governor of the canal.

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SOCIETY MEETINGS

JOINT OUTING OF ELECTRICAL SOCIETIES IN DETROIT.—The American Institute of Electrical Engineers, Detroit Section, and the Industrial Electrical Engineering Society of that city held a joint outing at Bois Blanc Park on Aug. 29. It is reported that plans are under way for the consolidation of the two organizations.

* * *

KANSAS CITY ELECTRIC CLUB.—The Electric Club of Kansas City, Mo., will hold its first meeting of the fall on Sept. 8, at the Baltimore Hotel, Kansas City. The club is composed of electrical engineers, manufacturers, jobbers, etc., and meets every second Tuesday at noon. At these luncheon sessions speakers address the club on subjects pertinent to the electrical industry.

* * *

INDIANA ASSOCIATION CHANGES MEETING PLACE.—Revising its tentative plan, the Indiana Electric Light Association has decided to hold its convention at Indianapolis, Sept. 23 and 24, instead of at Terre Haute, Sept. 24 and 25, as noted in the *Electrical World* of July 18 and Aug. 29. Meetings will be held at the Hotel Severin. Mr. Thomas Donohue, Lafayette, Ind., is secretary of the association.

* * *

PROMOTION OF SAFETY IN BOILER CONSTRUCTION.—On Sept. 15 the committee on boiler specifications of the American Society of Mechanical Engineers will hold a hearing at 29 West Thirty-ninth Street, New York, at which it will make its report on "Specifications for the Construction of Steam Boilers and Other Pressure Vessels and for the Care of Same in Service." Tentative drafts of this report have already been submitted to various recognized authorities for suggestions. The proposed standard specifications are intended to reduce the loss of life and property from boiler explosions.

* * *

CONVENTION OF KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION.—The date of the annual meeting of the Kansas Gas, Water, Electric Light and Street Railway Association, which was scheduled for Oct. 15, 16 and 17, has been changed. In order to avoid a conflict with the annual meeting of the Jovian Order, to be held in St. Louis, the Kansas association has postponed its meeting until Oct. 22, 23 and 24. The convention will be held at Arkansas City. Mr. W. H. Fellows, Leavenworth, Kan., is secretary of the association, and Mr. A. L. Newman, Arkansas City, is president.

* * *

PACIFIC COAST REJUVENATION.—On Sept. 12, during the joint convention of the Pacific Coast Section of the A. I. E. E. and the Northwest Section of the N. E. L. A. at Spokane, Wash., a rejuvenation will be held by members of the Jovian Order in attendance. Mr. H. B. Haggenmiller will be in charge of the degree work, and Mr. E. J. Simons will supervise the degree team, which will be made up as follows: Mr. C. L. Bankson, Hercules; Mr. H. B. Peirce, Mercury; Mr. C. F. Uhden, Vulcan; Mr. M. Sebern, Mars; Mr. L. F. Austin, Jupiter; Mr. H. K. Stacy, Neptune; Mr. H. L. Bargion, Pluto; Mr. L. N. Rice, Avrenim, and Mr. J. A. Gorman, Apollo. Following the initiation there will be a banquet at which Mr. H. L. Bleecker will preside as toastmaster.

Rapid Plant Construction at Hot Springs, Ark.

Handsome new 2500-kw turbine station ready 115 days after the destruction of former plant in conflagration of a year ago—Emergency service and construction methods

THE Citizens' Electric Company, Hot Springs, Ark., a subsidiary of the Federal Light & Traction Company, New York, has the distinction of breaking all previous records in constructing its new 2500-kw generating plant within 115 days after the destruction of its old station by fire Sept. 5, 1913, exactly one year ago. The old plant and several miles of feeder and distribution lines radiating therefrom were in the path of the conflagration which swept Hot Springs that September day, devastating nearly one-third of the city station, a feat to which is ascribed the fact that the whole city was not destroyed. These men left only when the fire was upon them and fortunately escaped without injury. The water-pumping station contained auxiliary steam-pumping equipment which was put in operation more than an hour before the electric service was interrupted. Though no rain had fallen for several weeks prior to the fire, the reserve capacity of the company's reservoirs was sufficient to maintain excellent pressure during the entire fire. This fortunate circumstance,

FIG. 1—RUINS OF BURNED PLANT, AND STATION FURNISHING EMERGENCY SERVICE

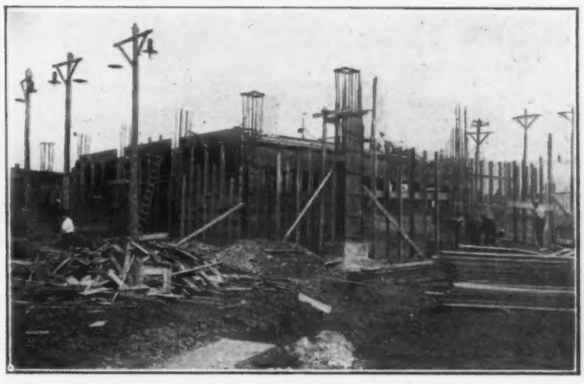


FIG. 2—HURRYING CONSTRUCTION NIGHT AND DAY; SIXTEEN DAYS AFTER BREAKING GROUND

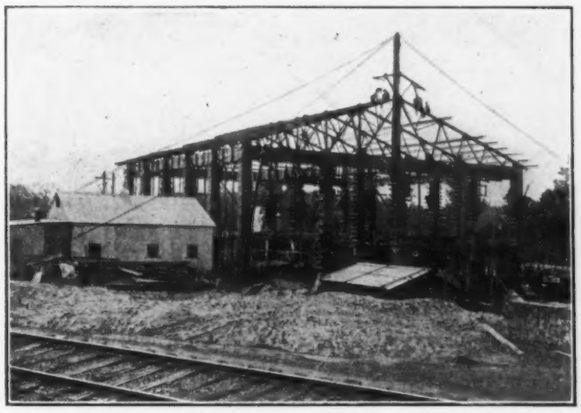


FIG 3—THE STEEL FRAME ERECTED THIRTY-TWO DAYS AFTER BREAKING GROUND

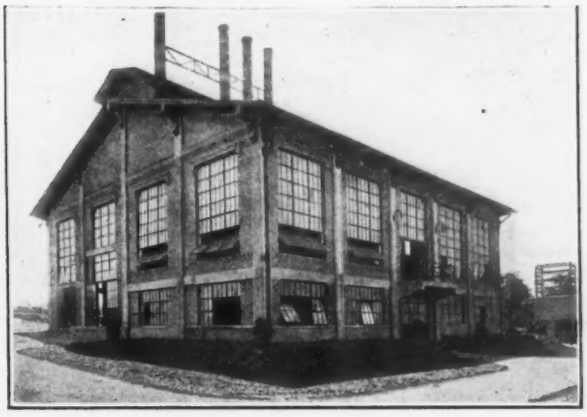


FIG. 4—THE FINISHED PLANT 115 DAYS AFTER BEGINNING CONSTRUCTION WORK

BUILDING A 2500-KW STEAM-TURBINE STATION IN 115 DAYS

—an area of fifty-five blocks—and crippling all electric service, including that of the street railways.

Although the doomed generating station was in the heart of the fire-swept district, it is interesting to note that electric service was supplied from the threatened plant to a motor-driven pumping station on the outskirts of the city throughout the early part of the fire and until long after the steam-pumping station had been placed in service. Great bravery was displayed by the power-plant engineers, who remained at their posts to operate the electrical equipment furnishing energy to the pumping taken with the devotion of the plant engineers, was the only thing that saved the rest of the city from destruction. An account of the damage caused by the fire was published in the *Electrical World* of Sept. 13, 1913.

Re-establishing Service

Before the fire was out at Hot Springs, the New York office of the Federal Light & Traction Company had become a scene of intense activity. Mr. W. A. Haller, general superintendent and chief engineer of the Federal Light & Traction Company, started for Hot Springs on

the afternoon of the fire, even before the destruction of the power station was reported. He examined the ruins and quickly outlined plans for the restoration of temporary service and the construction of a new station. Meanwhile the executive and purchasing departments began to rush new equipment to the stricken city, and manufacturing companies were called upon to aid. Telegrams were sent to all parts of the country tracing turbines and other equipment, either new or second-hand, which could be bought and hurried to Hot Springs. Rush orders were also placed for transmission, trolley and feeder wire.

Within ten days after the disaster emergency service was furnished the city, which had not yet recovered from the demoralizing effects of the fire, and coincident therewith the designs for a new station had been developed sufficiently to permit ordering apparatus and material for the construction of a new station on a new site. From this new plant regular service was established on Jan. 1, 1914, just 115 days after the fire. The new station, although built in this record-breaking time, is well arranged and presents the appearance of a beautiful and efficient piece of construction.

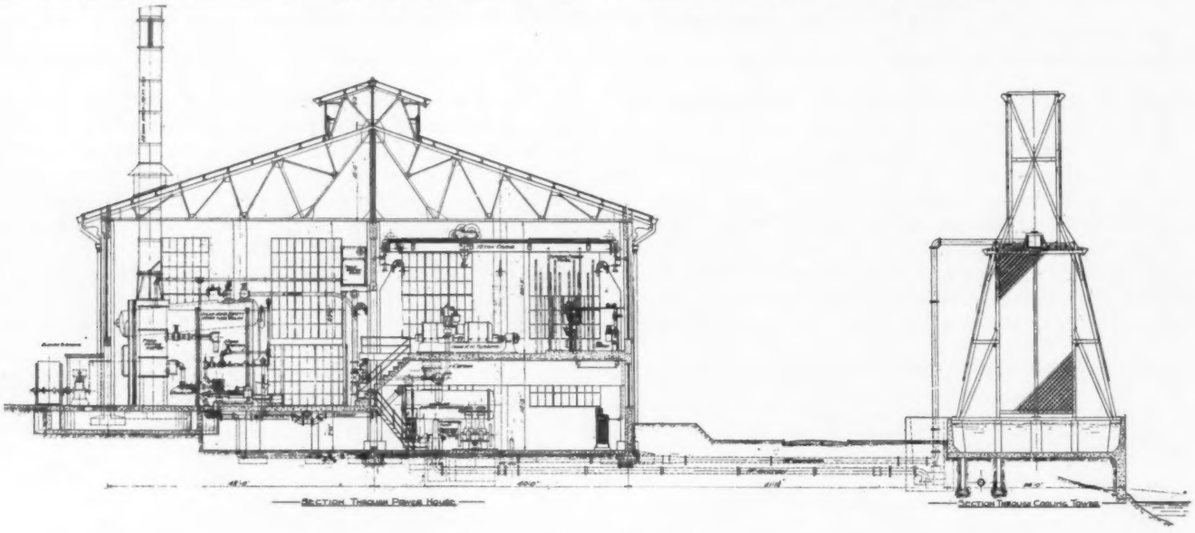


FIG. 5—VERTICAL SECTIONS OF STATION AND COOLING TOWER

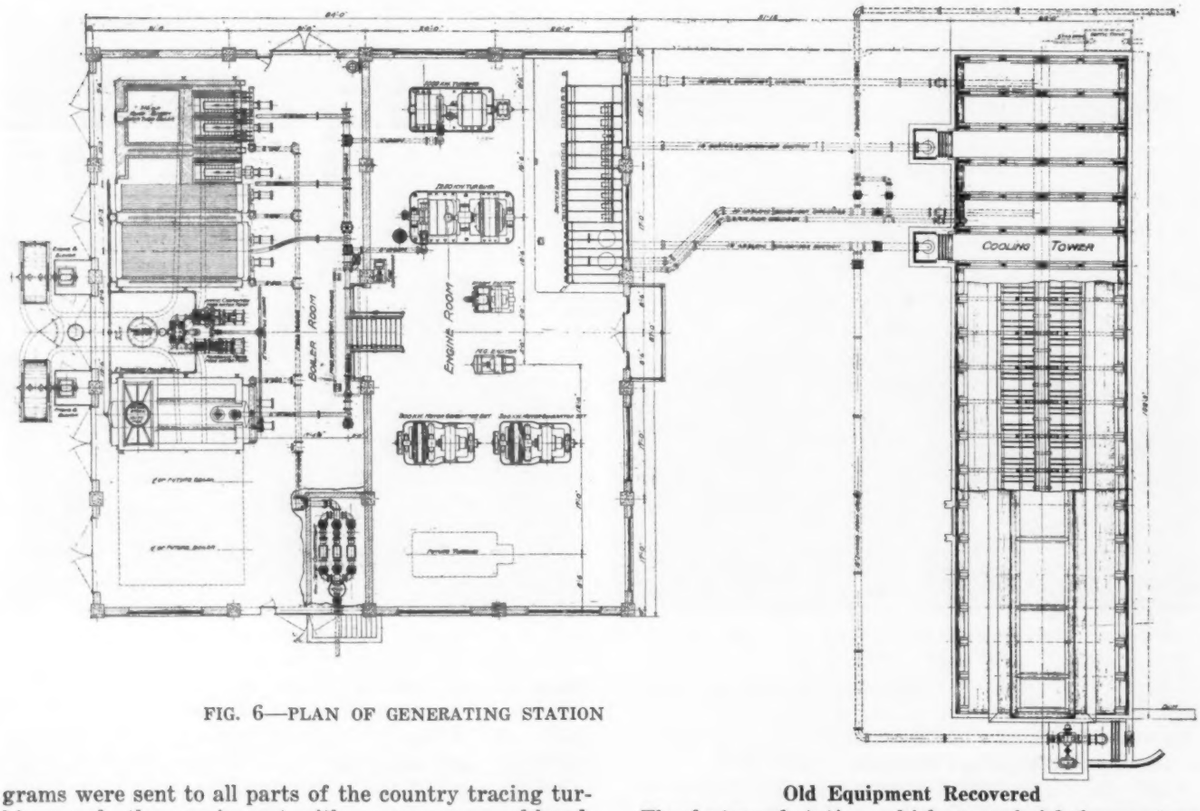


FIG. 6—PLAN OF GENERATING STATION

Old Equipment Recovered

The destroyed station, which was a brick-frame structure, contained 2600 kw in Westinghouse and General Electric generating equipment, 450 kw of which was engine-driven and the remainder turbine-driven. The steaming apparatus consisted of 1860 hp in Stirling boilers. The entire building was demolished and most of the equipment was rendered unfit for operation. Upon investigation, however, it was found that the

1250-kw General Electric turbine-driven generator could be used if rewound and the external mechanical parts replaced. Expert repairmen were sent by the manufacturer to put the unit in condition for operation, which feat was accomplished in three days and nights from the time the material was received. Although the boilers were badly damaged, several of them were restored and

FIG. 7—ENGINE ROOM

temporarily operated at reduced pressure until the new station took over the load. A temporary corrugated sheet-iron building was erected on the site of the burned plant to house the turbines, switchboard and railway apparatus.

As the rest of the equipment was unserviceable, the surrounding territory was canvassed for auxiliary apparatus. A 30-kw engine-driven exciter was secured from the Springfield (Mo.) station and shipped to Hot Springs by express; a motor-generator set for railway supply was shipped on a personally accompanied car from Lynn, Mass., and a new switchboard which was

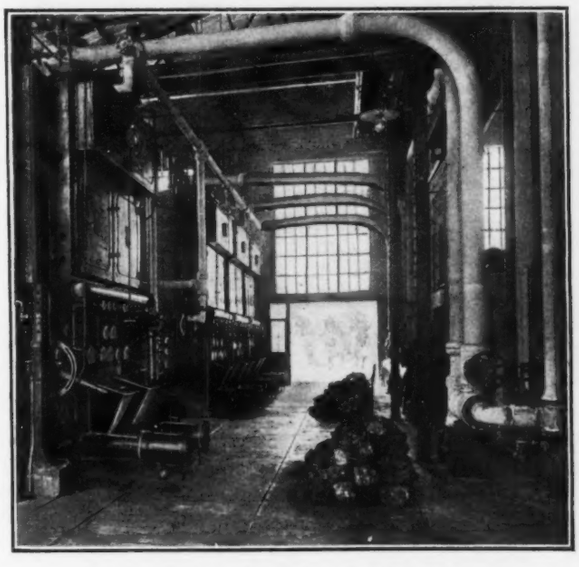


FIG. 8—GAS-BURNING BOILERS

just being installed by the Federal Light & Traction Company in Albuquerque, N. M., was expressed to Hot Springs for use in the temporary station. As the distribution system in the burned district had to be replaced, new poles were secured from the local telephone company and from telephone companies in Little Rock, Ark., and Memphis, Tenn. Wire was obtained from different branches of the American Steel & Wire Company.

Materials were received and workmen were engaged so that about 5 miles of line had been strung by the time the temporary generating station was ready for operation. Emergency lighting and motor service was restored on Sept. 15, railway service being re-established seven days later.

Emergency Railway Service

During the rehabilitation period emergency service was furnished by the railway department of the company by operating horse cars in various parts of the city. To render this service the smaller electric cars were stripped of electrical apparatus to reduce their weight and were equipped to be drawn by mules. The mule cars were later supplemented by tally-ho coaches and automobiles giving transportation service at the regular 5-cent rate. It is worthy of note that the mule cars proved to be the smallest revenue producers, while the

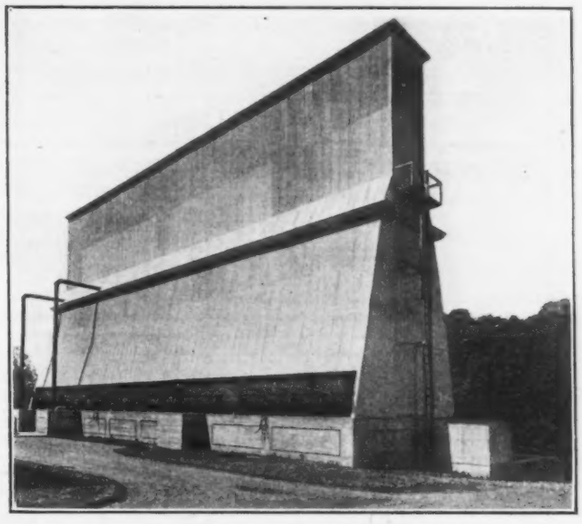


FIG. 9—COOLING TOWER

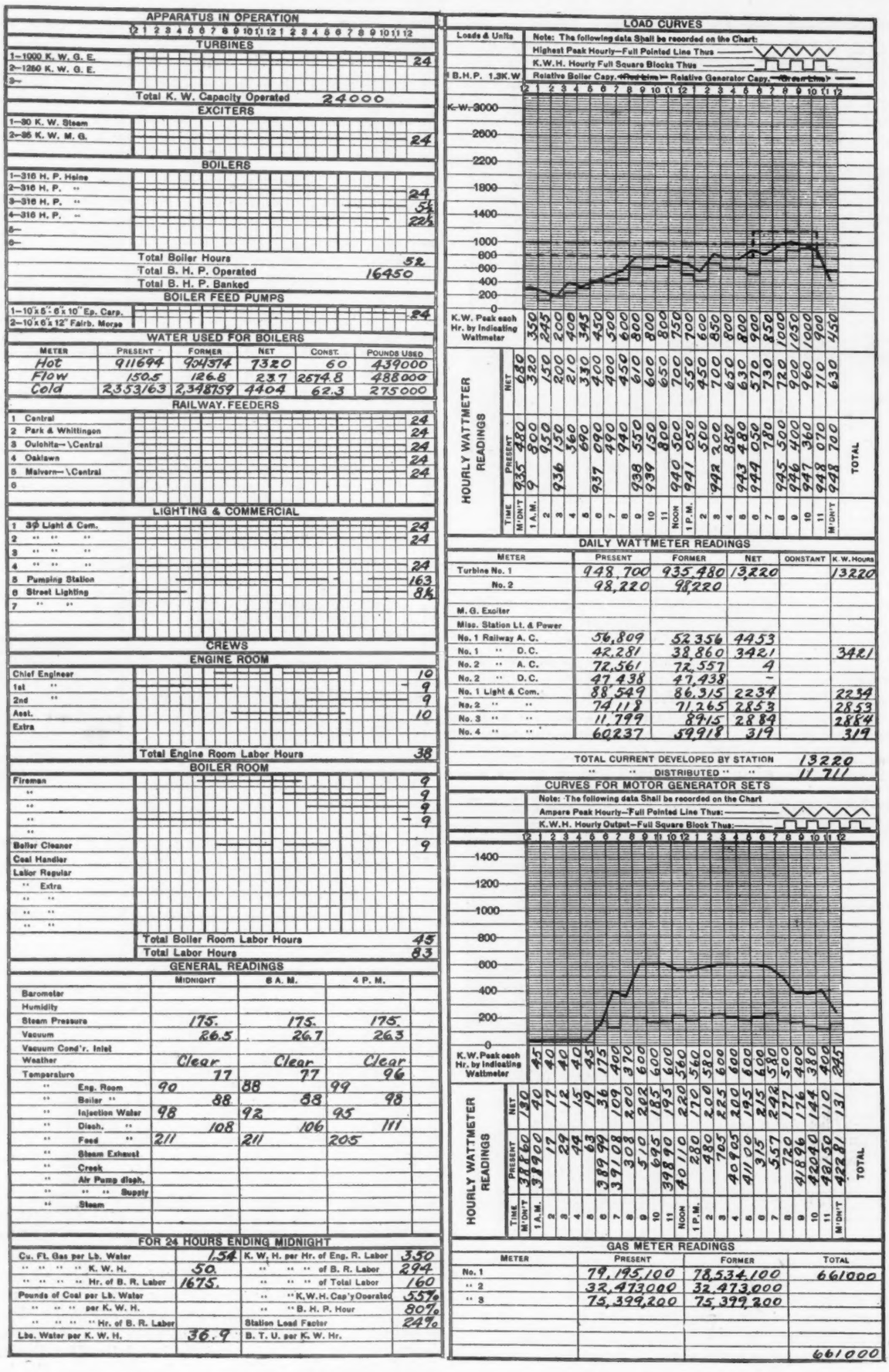
automobiles, hired at $20 a day, gave the best service, were the best earners, and almost paid for their rental.

Preparations for New Station

To build a power plant under the best of conditions requires elaborate preliminary investigations to determine upon the location and the type and size of station to be constructed, and detailed study to develop the construction plans. In addition to the time consumed in assigning contracts for equipment, material and labor, and in actual construction, there are usually numerous delays brought about by bad weather, failure of material to arrive, labor conditions, etc. The work of constructing the new Hot Springs station was, however, carried on with unprecedented dispatch, and the apparatus and materials arrived on the job in most instances within a day or two of the time required.

Designing and construction engineers employed on other properties of the parent company were ordered to Hot Springs even before the fire had ceased. These men rendered valuable and efficient help, first in establishing temporary service and later in designing and constructing the new station.

As the old property had acquired a value which made it undesirable to reconstruct the generating station on that site, the company's representatives selected and purchased a tract of land about a mile south of Hot Springs on the "Iron Mountain" railroad and the Hot Springs Creek. Although the new site is not so near the load center of the system as was the old plant, the site is



APPARATUS IN OPERATION

TURBINES

1–1000 K. W. G. E.	24
2–1250 K. W. G. E.	
3–	

Total K. W. Capacity Operated 24000

EXCITERS

1–30 K. W. Steam	
2–35 K. W. M. G.	24

BOILERS

1–316 H. P. Heine	24
2–316 H. P. "	5½
3–316 H. P. "	22½
4–316 H. P. "	
5–	
6–	

Total Boiler Hours 52
Total B. H. P. Operated 16450
Total B. H. P. Banked

BOILER FEED PUMPS

1–10"x8"-6"x10" Ep. Carp.	
2–10"x8"x12" Fairb. Morse	24

WATER USED FOR BOILERS

Meter	Present	Former	Net	Const.	Pounds Used
Hot	911694	904374	7320	60	439000
Flow	1505	1268	237	2574.8	488000
Cold	2,353,163	2,348,759	4404	62.3	275000

RAILWAY FEEDERS

1 Central	24
2 Park & Whittington	24
3 Ouachita–\Central	24
4 Oaklawn	24
5 Malvern–\Central	24
6	

LIGHTING & COMMERCIAL

1 3φ Light & Com.	24
2 " " "	24
3 " " "	
4 " " "	24
5 Pumping Station	16½
6 Street Lighting	8½
7 " "	

CREWS

ENGINE ROOM

Chief Engineer	10
1st "	9
2nd "	9
Asst.	10
Extra	

Total Engine Room Labor Hours 38

BOILER ROOM

Fireman	9
"	9
"	9
"	9
"	
Boiler Cleaner	9
Coal Handler	
Labor Regular	
" Extra	
" "	
" "	
" "	

Total Boiler Room Labor Hours 45
Total Labor Hours 83

GENERAL READINGS

	Midnight	8 A. M.	4 P. M.
Barometer			
Humidity			
Steam Pressure	175.	175.	175.
Vacuum	26.5	26.7	26.3
Vacuum Cond'r. Inlet			
Weather	Clear	Clear	Clear
Temperature	77	77	96
" Eng. Room	90	88	99
" Boiler "	88	88	98
" Injection Water	98	92	95
" Disch. "	108	106	111
" Feed "	211	211	205
" Steam Exhaust			
" Creek			
" Air Pump disch.			
" " " Supply			
" Steam			

FOR 24 HOURS ENDING MIDNIGHT

Cu. Ft. Gas per Lb. Water	1.54	K. W. H. per Hr. of Eng. R. Labor	350
" " " " K. W. H.	50.	" " " of B. R. Labor	294
" " " " Hr. of B. R. Labor	1675.	" " " of Total Labor	160
Pounds of Coal per Lb. Water		" "K.W.H. Cap'y Operated	55%
" " " per K. W. H.		" "B. H. P. Hour	80%
" " " " Hr. of B. R. Labor		Station Load Factor	24%
Lbs. Water per K. W. H.	36.9	B. T. U. per K. W. Hr.	

LOAD CURVES

Loads & Units

Note: The following data Shall be recorded on the Chart:
Highest Peak Hourly—Full Pointed Line Thus ——
K.W.H. Hourly Full Square Blocks Thus ——
1 B.H.P. 1.3K.W
Relative Boiler Capy. ~~Red Line~~ — Relative Generator Capy. ~~Green Line~~ —

K.W. 3000 2600 2200 1800 1400 1000 800 600 400 200 0

K.W. Peak each Hr. by Indicating Wattmeter: 350 245 200 400 345 430 300 600 800 800 800 750 700 600 850 800 800 850 1000 1050 1000 900 450

HOURLY WATTMETER READINGS

Time	Present	Net
M'DN'T	935 480	680
1 A.M.	9 800	320
2	936 150	150
3	936 360	200
4	690	210
5	937 090	330
6	490	400
7	940	450
8	938 550	610
9	939 150	600
10	800	650
11	940 500	700
NOON	941 050	550
1 P.M.	500	450
2	942 300	700
3	850	650
4	943 480	630
5	944 050	570
6	780	730
7	945 500	720
8	946 400	900
9	947 360	960
10	948 070	710
11	948 700	630
M'DN'T		TOTAL

DAILY WATTMETER READINGS

Meter	Present	Former	Net	Constant	K. W. Hours
Turbine No. 1	948,700	935,480	13,220		13220
No. 2	98,220	98,220			
M. G. Exciter					
Miss. Station Lt. & Power					
No. 1 Railway A. C.	56,809	52,356	4453		
No. 1 " D. C.	42,281	38,860	3421		3421
No. 2 " A. C.	72,561	72,557	4		
No. 2 " D. C.	47,438	47,438	–		
No. 1 Light & Com.	88,549	86,315	2234		2234
No. 2 " "	74,118	71,265	2853		2853
No. 3 " "	11,799	8915	2884		2884
No. 4 " "	60,237	59,918	319		319

TOTAL CURRENT DEVELOPED BY STATION 13220
" " DISTRIBUTED " " 11 711

CURVES FOR MOTOR GENERATOR SETS

Note: The following data Shall be recorded on the Chart
Ampere Peak Hourly—Full Pointed Line Thus: ——
K.W.H. Hourly Output—Full Square Block Thus: ——

1400 1200 1000 800 600 400 200 0

K.W. Peak each Hr. by Indicating Wattmeter: 45 40 40 45 175 400 310 600 600 600 600 560 560 580 600 600 600 600 500 400 380 400 245

HOURLY WATTMETER READINGS

Time	Present	Net
M'DN'T	388 60	180
1 A.M.	389 00	40
2	17	17
3	29	12
4	44	15
5	63	19
6	389 99	36
7	391 08	109
8	308	200
9	510	202
10	695	185
11	39890	195
NOON	40 110	220
1 P.M.	280	170
2	480	200
3	705	225
4	40905	200
5	41100	195
6	315	215
7	557	242
8	720	177
9	896	176
10	42040	144
11	42150	110
M'DN'T	422 81	131
		TOTAL

GAS METER READINGS

Meter	Present	Former	Total
No. 1	79,195,100	78,534,100	661000
" 2	32,473,000	32,473,000	
" 3	75,399,200	75,399,200	
			661000

FIG. 10—OPERATING RECORD ON STATION LOG SHEET

admirably located for the future since the city is rapidly extending in that direction.

Building plans for the new station were started on Sept. 10, all the engineering and designing being done on the job so that actual construction could be carried on in parallel with the drafting, thus avoiding delay. Ground was broken on Sept. 16, a work office was constructed, and temporary electric-service lines were erected to supply energy for lighting and motors on the job when emergency service from the temporary station was restored on Sept. 15. Meanwhile rush orders for immediate shipment had been sent out for equipment and building material. Roof trusses and crane runways were obtained from Memphis, Tenn.; sand, cement, brick and gravel from local firms, and reinforcing steel from St. Louis. A crane was shipped to the site in ten days, two boilers were ordered for delivery by Oct. 21, a 1000-kw turbo-generator set was ordered from stock

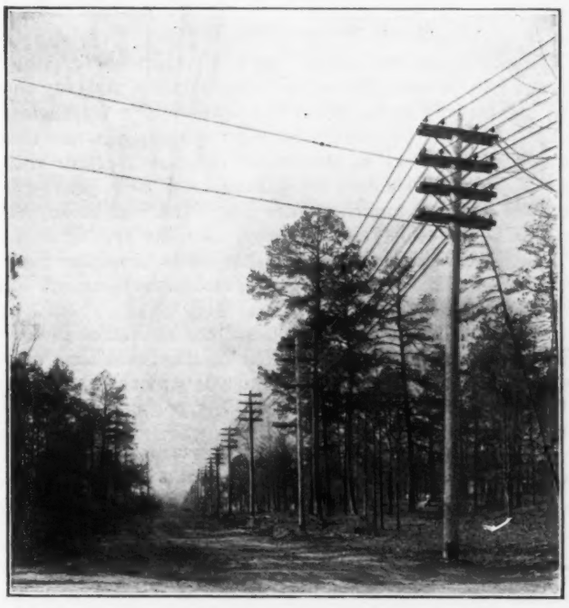


FIG. 11—TYPE OF TRANSMISSION LINE FROM NEW STATION

and shipped three days later, followed by personal tracers, and the condenser was sent within three days.

To hasten the work, night shifts were employed wherever double shifts could be employed to advantage, and light was provided by tungsten lamps suspended from poles erected along the sides of the building line. Messenger wires supporting additional lamps were strung from these poles to a wooden elevator tower at one side of the building. Riveting, concrete chipping, etc., were performed by compressed-air apparatus.

Progress on New Station

By Sept. 23 foundation forms were in place and concrete was being poured. The concrete up to the main engine-room floor was all poured within two weeks, and by Oct. 21 the roof trusses, with the exception of the monitor, were in place. Boilers were being installed early in November, and steam was raised and some of the apparatus had a preliminary try-out on Dec. 10. The station was operated intermittently thereafter until Jan. 1, when the electrical equipment was in shape for regular service. From that time on energy for lamp and motor service has been delivered regularly from the new station. The 1250-kw generator and the 300-kw motor-generator set in the temporary station were then transferred to the new plant, making the total rating of the station 2250 kw.

The removal of the 300-kw railway motor-generator from the temporary station to the new station was a feature worthy of note. The second motor-generator had not arrived in Hot Springs at the time the new station was ready for operation; therefore it became necessary to remove to the new station the machine then being operated in the temporary station. To insure the least possible interruption to the railway service, the motor-generator was shut down at midnight Jan. 14, disconnected and transported 800 ft. on rollers, there loaded onto a flat car and transferred to the new station, installed, connected and placed in operation by 7:15 the following morning, the total time consumed being six hours and forty-five minutes.

Description of Plant Equipment

The new station is a reinforced-concrete structure with brick curtain walls, steel sash and doors fitted with wired glass throughout, and steel roof trusses carrying a roof consisting of two layers of corrugated galvanized iron with a layer of 1-16-in. asbestos placed between to prevent sweating.

The present equipment of the new station consists of two 2300-volt turbo-generator units rated at 1000 kw and 1250 kw respectively, two 300-kw synchronous-motor-generator sets, one 30-kw induction-motor-driven exciter, one 30-kw marine-engine-driven exciter, four 316-hp Heine boilers equipped to burn gas or coal, a 20-ton Whiting crane, and the usual auxiliaries. The motor-generator sets operate at 2300 volts. The switchboard was constructed, assembled and shipped thirty days after the order was given. Space has been provided in the station for the addition of two more boilers and one more turbo-generator set. All of the electrical equipment, except the motor-driven exciter, was furnished by the General Electric Company. The exciter was built by the Westinghouse Electric & Manufacturing Company.

Cooling Tower

As the water in the creek adjoining the plant comes from the famous hot springs and is too warm for condensing purposes, besides containing considerable sewage, it was necessary to erect a cooling tower. This tower, which is of the natural-draft type, consists of a long trough at the top connecting with projecting laterals which are slotted to allow water to trickle down over the cooling surfaces. The latter consist of square wooden bars supported in a horizontal position with one diagonal in the vertical position. By arranging the bars in this position a larger effective cooling surface is presented to the water, which is also assisted in its downward course by the sharp edges of the bars being lowermost.

Gas-Burning Furnaces

Each boiler is equipped to burn either gas or coal. Eleven Gwynn gas burners are employed under each boiler for burning gas, and two Jones underfeed stokers are installed under each boiler for coal firing. The gas nozzles are arranged above the furnace doors so that they do not interfere with coal combustion, it being possible to carry on both methods of firing at the same time. When only gas is being burned the grates are kept covered with ashes to prevent their being fused by heat reflected from the furnace arch. Natural gas is piped into this plant from the Caddo-Louisiana fields.

The Hot Springs plant is now producing an average of 1 kw-hr. of energy per 50 cu. ft. of gas burned. The gas contains 850 lb.-Fahr. heat units per cu. ft. The amount of labor required per kilowatt-hour developed is also very low for a station of this size, an average of 160 kw-hr. of energy being generated per hour of operating labor.

High-Tension Distribution in Central Texas—II

Commercial organization of the Texas Power & Light Company and sale of service to local industries—Electrical operation of cotton gins, pumping plants, railway shops, etc.

FOR the purpose of commercial organization the territory served by the company is divided into five "branches," each branch's headquarters being in the chief town of its district. The manager of such a branch has general charge of all matters relating to dealings with customers in his territory, which usually includes, besides the headquarters city, several smaller outlying towns where no company representative is regularly stationed.

The branch manager reports directly to the general superintendent and the general manager and maintains his own staff of clerks, meter readers and linemen. The latter are under the orders of the local manager for all work in connection with distribution construction, but are subject to call by the power department for assistance on the high-tension lines when needed.

Salesmen, on the other hand, are detailed to the local manager on request to the sales department, and during the time the salesman is in the branch territory his salary and expenses are charged to the local office. The commercial department now has a dozen trained salesmen, many of whom specialized on some particular department of central-station service. The assistance of these experts is particularly valuable, of course, when special campaigns are to be undertaken. Credit for sales is in each case assigned to the local business office, the branch manager being held entirely responsible for results.

Construction work being done in any of the branch districts is in charge of a resident engineer who is detailed by the construction department to "be on the job" and to confer with the local manager if the latter has suggestions to offer. Attached to the main office staff there is also a general meter inspector who travels about the system and supervises the care of meters, switches and electrical apparatus in general.

Meter Reading and Billing

The customers' meters of the entire branch territory are read by a man from the branch headquarters, and bills are later sent out from the same office. Customers in the "section" towns where the company has no office may remit by check to the branch headquarters or they may pay cash to some designated local merchant who receives a fixed monthly sum for handling these collections for the electric company. As the arrangement is one which brings people to his store, the merchant usually finds this service a good local advertisement for his own business.

In the smaller towns of this system residence meters are, whenever possible, installed on the back or front porches so that they may be read without the inspector entering the house. This accessibility proves especially useful on muddy days and at times when the occupants of the house are absent. As the meter reader may remain in a small town only part of a day before moving on to the next one, it is important that he be able to make all of the readings quickly and conveniently.

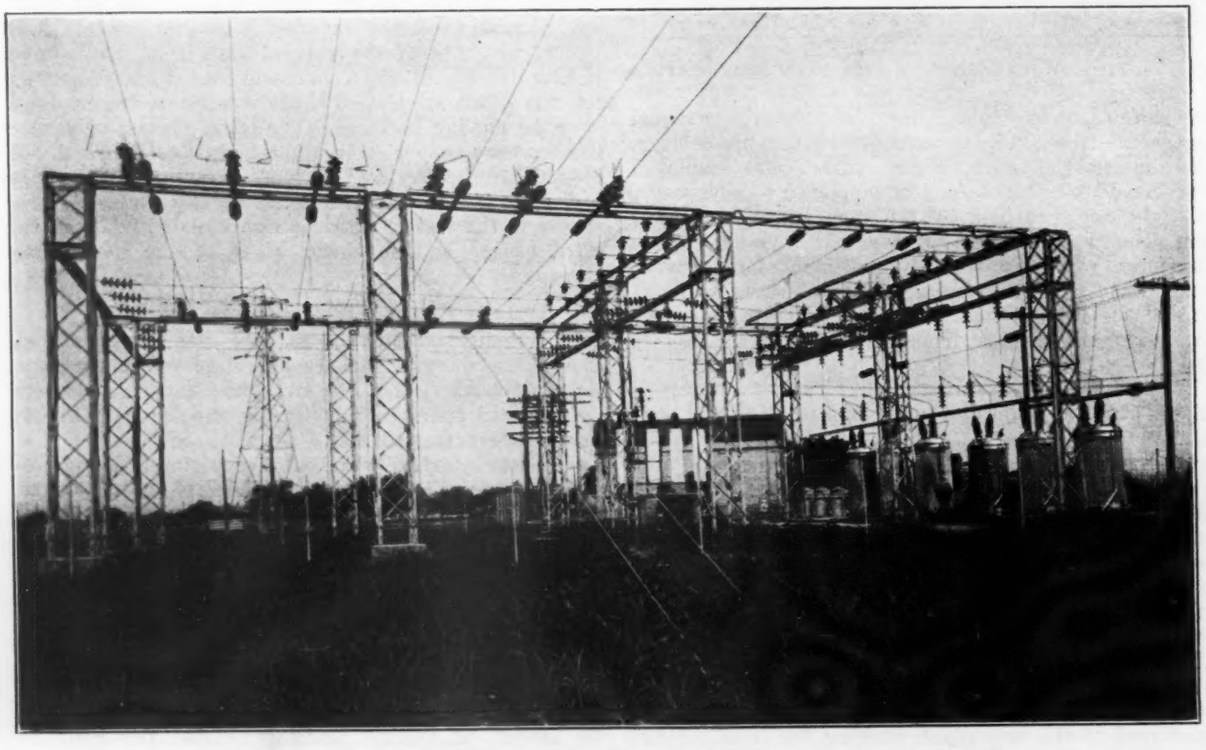


FIG. 17—COMBINED RAILWAY AND LIGHTING SUBSTATION AT WAXAHACHIE

The rates of the Texas Power & Light Company are thoroughly standardized despite the large territory and wide variety of conditions under which the company furnishes service. In the larger cities the residence-lighting rate is 14 cents per kw-hr. for the first 20 kw-hr. and 7 cents for all thereover. In the smaller communities the corresponding rates are 15 cents and 8 cents per kw-hr. The minimum monthly bill is $1, and customers receive a cash discount of 10 per cent for prompt payment.

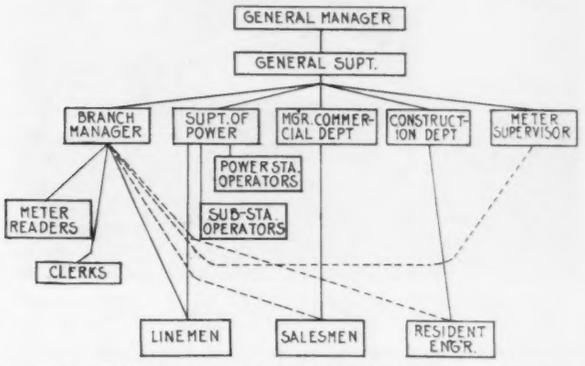


FIG. 18—OPERATING ORGANIZATION. TEXAS POWER & LIGHT COMPANY

Co-operation with Dealers and Contractors

The company handles no supplies or lamps, referring all merchandise business to the local dealers and contractors in its communities. Motors are sold by the power company only when necessary to serve the customer's interest, as in the case of hurried installations, etc. In every way possible the contractor and dealer is encouraged to expand his own business to its fullest extent, and to this end there is even offered the co-operation of the company's advertising department to assist the dealer in preparing his advertising matter.

In cases where a prospective customer desires to have his house wired and to pay for the work on the instalment plan the company will, after having solicited the business, turn the job over to the contractor at a discount of 10 per cent, meanwhile repaying itself from the customer in four or six monthly instalments. A fixed schedule of unit housewiring costs is agreed upon between the contractors and the company. A recent survey of the territory showed that in the towns served the proportion of wired to unwired dwellings ranges from 26 per cent to 69 per cent. These ratios are affected, however, by the large number of negroes in some of the communities. The ratio of wired to unwired business buildings similarly varies from 58 per cent to 100 per cent.

All service is metered, and no flat rates are offered except for patrolled sign and outline lighting and "awning" lamps. In the towns served by the company many business establishments have permanent wooden "awnings" sheltering the sidewalks in front of their show windows. Lamps on the undersides of these awnings serve to light the thoroughfares after dark and provide a form of ornamental illumination which corresponds to "white-way" lighting in other communities.

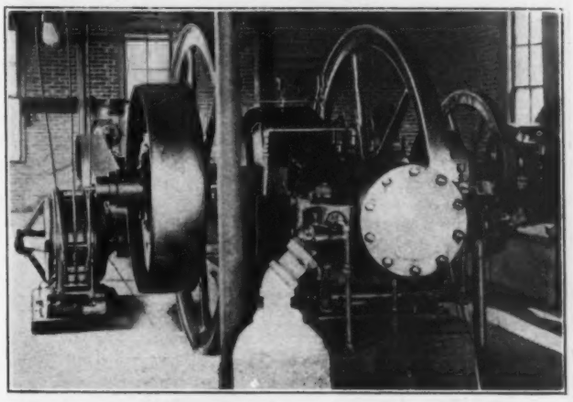


FIG. 20—35-HP MOTOR REPLACING GASOLINE ENGINE IN WATER-WORKS PUMPING STATION

Street-lighting service furnished by the company is by 4-amp series tungsten lamps in towns of less than 10,000, and by 4-amp magnetite-arc lamps and tungsten units in the larger cities. Lamps are lighted and extinguished on the all-night basis, the rates for the service being as follows:

100-cp series tungsten lamps	$2.00 per month
80-cp series tungsten lamps	1.50 per month
60-cp series tungsten lamps	1.25 per month
4-amp magnetite lamp	72.00 per year

Among the principal motor loads of the Texas Power & Light Company are the electric interurban and street railways in its territory, cotton gins, cottonseed-oil mills, cotton mills, flour mills, city pumping plants, railway shops, brick plants and small refrigerating outfits. Owing to the warm climate of this section of Texas, the company also enjoys a large day fan load which con-

FIG. 19—ELECTRIC-SERVICE LINES TO COTTON GIN

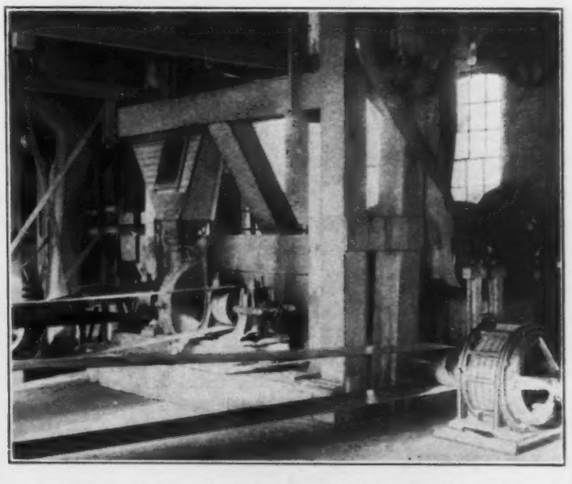


FIG. 21—ATTRITION MILL DRIVEN BY 75-HP MOTOR

FIG. 22—OUTDOOR INSTALLATION OF RESIDENCE METER

tributes considerably to the improvement of its load-factor.

Some twenty cotton gins are now served by the lines of the company. These establishments secure the special gin rate under which the first 3000 kw-hr. are sold at 5 cents per kw-hr., the second 2000 kw-hr. at 4 cents per kw-hr., and all over this amount at 3 cents per kw-hr.

The ginning load begins about the middle of August and continues until January. The average gin has a connected load of about 100 hp in motors and is usually operated twelve hours daily.

A typical ginning installation is that shown in Fig. 19. The incoming 4000-volt lines are led to the trans-

FIG. 24—BRANCH OFFICE AND STAFF, HILLSBORO

former-pole structure shown at the right of the illustration. At one end of the platform is seen the pole-type oil switch which interrupts the main circuit. This switch is manipulated by a pull rope reached from the ground, so that by giving the handle a jerk the entire mill equipment may be de-energized when service is not required.

A 20-hp motor drives the suction blower in the octagonal cotton house seen in the foreground. By means of air pressure the cotton is first removed from the wagons to the bins inside this building, and is later transferred to the gin, which is shown in the background of the picture. Each "side" of the gin, consisting of four "stands" of eighty "saws" each, is

FIG. 23—INTERIOR OF ELECTRICALLY OPERATED COTTON GIN

driven by a 75-hp motor. A 15-hp motor drives the air compressor with which water is pumped to operate the hydraulic compress in which the bales receive their initial squeeze. The energy cost for ginning a bale of cotton at this plant has been found to average about 60 cents. The introduction of electrical service in the Texas region has worked great economies for the local gin owners, for the installation of an electric motor saves at least one-half the cost of a boiler and engine, besides avoiding the necessity of hauling water and fuel, which are sometimes difficult to obtain in this section. With electric drive the services of a stationary engineer can also be dispensed with.

Cottonseed-Oil and Cotton Mills

The cottonseed-oil mills, of which the company operates about half a dozen, start in July and run until the first of the following April. These mills average connected loads of about 300 hp and during the period of operation are run continuously all the twenty-four hours of the day, so that the load is a valuable one from the standpoint of load-factor improvement. The cottonseed-oil mills, like the flour and cotton mills, take advantage of the company's special high load-factor rate, which comprises a connected-load charge of $1.50 per kw per month plus 1.25 cents per kw-hr. for the energy consumed.

The commercial department is now making special efforts to acquire cotton mills, several of which are already in operation from the company's lines. These mills operate long hours daily and are therefore particularly desirable on account of their high load-factors.

Brick plants, of which the power company serves a number, also offer a favorable element in their summer operation, which is coincidental with the season of greatest building activity. These plants ordinarily begin in February and are operated until September, shutting down soon after the wane of the building season.

A number of small refrigeration plants are served from the transmission system, but there are as yet no ice factories such as have been operated successfully in the larger cities of the North. Southern people have been so accustomed to perfectly clear artificial ice that they do not take kindly, it is explained, to raw-water ice. For this reason the electrically operated ice factory in Texas cannot yet compete with steam-operated plants which provide their own distilled-water supply.

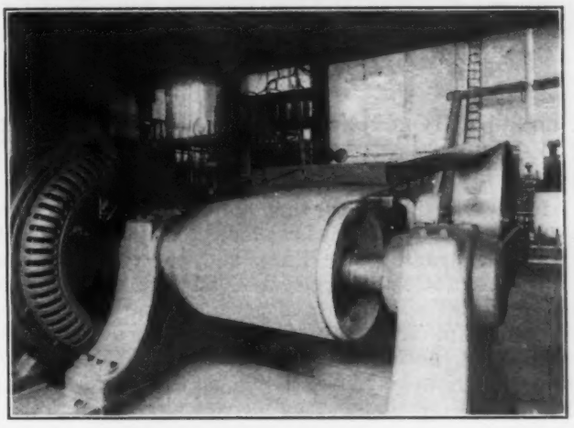


FIG. 26—400-HP MOTOR DRIVING COMPRESSOR IN RAILROAD SHOPS

In ten of the cities and towns reached by its lines the company has also acquired the municipal water-supply pumping. These pumping installations range from 3 hp

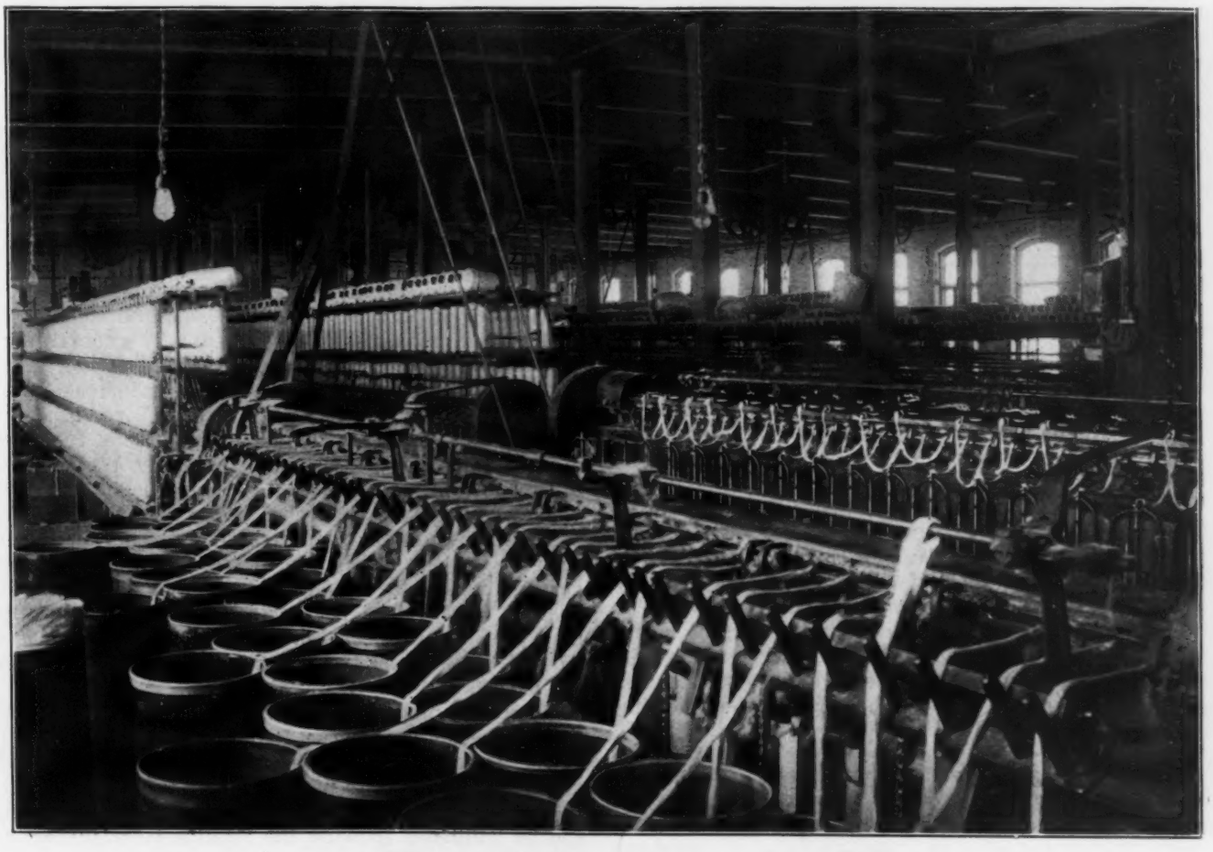


FIG. 25—MOTOR DRIVE IN COTTON MILL, WEST, TEX.

to 180 hp in motor rating and are served on the kilowatt-hour basis, the municipality furnishing the motors and equipment and purchasing from the central-station company the energy required.

Mr. J. F. Strickland is president of the Texas Power & Light Company and Mr. George S. Haley is vice-president and general manager. Mr. F. R. Slater is general superintendent, Mr. G. S. Schmauder is superintendent of power, and Mr. Hartwell Jalonick is manager of the commercial department.

Simplified Hyperbolic Calculations for Transmission Lines

BY H. B. DWIGHT

It is generally agreed that the voltage of long transmission lines obeys the laws indicated by the hyperbolic theory of transmission lines, and electrical formulas, to be acceptable to engineers, must give the results of the hyperbolic theory with good accuracy. It is still a mooted question, however, what method is best for calculating the above results. This should not be the case, for it can be shown that if all the proffered methods are conscientiously used for solving a given problem on long transmission lines, one method will undoubtedly be chosen as superior to the others, because of its easiness to learn, its shortness for routine work, and its complete accuracy. This is the method of convergent series.

The method of convergent series in its present simple form was first announced, so far as the writer is aware, in the *Applied Science Magazine*, University of Toronto, March, 1909, by Prof. T. R. Rosebrugh, who shortly after gave a further description of it in the *Proceedings*, A. I. E. E., November, 1909. The method has been thoroughly described and recommended in various articles and books, and hence in the present article an attempt will be made merely to show by a definite example how advantageous this method is.

The article by Dr. A. E. Kennelly and Dr. Harold Pender in the *Electrical World* of Aug. 8, 1914, contained many valuable results. It was shown that, in the absence of extremely exact test measurements of actual long transmission lines for checking the hyperbolic theory, an artificial line can be used to good advantage. It was also shown that for certain problems of practical engineering importance the results of the hyperbolic theory are necessary. However, the two methods shown in the above article for calculating the results are, to say the least, forbidding to many electrical engineers. It is only fair to show an alternative method of obtaining exactly the same calculated results, and the choice of methods can then be made by anyone, whether skilled or not in the use of trigonometric tables or of special charts and tables for hyperbolic cosines, etc.

The problem of finding line voltages, which is solved in two ways in the article referred to, can be accurately solved without the use of any tables whatever, and without any mathematical feature of any difficulty except the usual use of complex quantities, which is becoming quite common in alternating-current calculations. In order to show how short this method is, every step which would be made by anyone solving this problem for the first time will be given in the following paragraph.

Formula:

$$E_a = E_b\left(1 + \frac{YZ}{2} + \frac{Y^2Z^2}{2.3.4} + \frac{Y^3Z^3}{2.3.4.5.6} + \frac{Y^4Z^4}{2.3.4.5.6.7.8} + \text{etc.,}\right)$$

$$Z = 8\ (3.83 + j\,66.28)$$

(From data given) $Y \div 2 = 4\ (3.2 + j\,577.2)\ 10^{-4}$

$$\begin{aligned}
&-1.2242 + j\,0.0068\\
&+0.0004 + j\,0.0707\\
YZ \div 2 = &-1.2238 + j\,0.0775\\
YZ \div 12 = &-0.2040 + j\,0.0129\\
&+0.2496 - j\,0.0158\\
&-0.0010 - j\,0.0158\\
Y^2Z^2 \div (2.3.4) = &+0.2486 - j\,0.0316\\
YZ \div 30 = &-0.0816 + j\,0.0052\\
&-0.0203 + j\,0.0013\\
&+0.0002 + j\,0.0026\\
Y^3Z^3 \div (2.3.4.5.6) = &-0.0201 + j\,0.0039\\
YZ \div 56 = &-0.0437 + j\,0.0028\\
&+0.0009 - j\,0.0001\\
&0 - j\,0.0002\\
Y^4Z^4 \div (2.3.4.5.6.7.8) = &+0.0009 - j\,0.0003
\end{aligned}$$

Further terms of the series are plainly negligible. Adding the series,

$$\begin{aligned}
&+1.00\\
&+0.2486 - j\,0.0316\\
&+0.0009 - j\,0.0003\\
&+1.2495 - j\,0.0319\\
&-1.2238 + j\,0.0775\\
&-0.0201 + j\,0.0039\\
&-1.2439 + j\,0.0814\\
\text{Sum} = &+0.0056 + j\,0.0495
\end{aligned}$$

$$\text{Effective value of series} = 0.0495 + \frac{0.0056 \times 0.0056}{2 \times 0.0495}$$

$$= 0.0495 + 0.0003$$

$$= 0.0498$$

$$\text{Therefore} \qquad E_b = E_a \times \frac{1}{0.0498}$$

$$= 51.5 \times 20.06$$

$$= 1033 \text{ volts.}$$

In contrast to the above small amount of arithmetical and slide-rule work, the "calculation by simple trigonometry" requires finding with exactness from the tables angles θ, φ and ψ and calculating four rather long algebraical formulas. So, also, the "calculation in terms of hyperbolic functions" requires looking up three angles in trigonometric tables and one value from a chart of hyperbolic cosines, besides an amount of multiplying, taking square root, etc. The actual labor of doing this work with exactness consumes more time than calculating the series, and there is increased risk of error due to complicated and unusual formulas.

It may be true that the use of hyperbolic functions is necessary for solving high-frequency problems in telephone and wireless work. Hyperbolic functions will have the best chance of being advantageous for energy-transmission lines in high-frequency problems, such as the one herein considered. If, then, the convergent series are less laborious, even for a line of quarter wave-length, it is evident that for more ordinary problems the series should be the only method considered, since one or two terms of the series are all that are needed.

The result of the above comparison of methods is the same for load conditions as for no-load conditions. It is, therefore, reasonable to suggest that before electrical engineers are asked to use hyperbolic functions directly in energy-transmission problems, a thorough comparison be published showing the relative laboriousness of the different available methods.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods and Current Practice Among Successful Utilities

A Dollar-a-Month Wiring Offer at Kansas City

The Kansas City Electric Light Company has been prosecuting an especially effective campaign for the installation of electricity in homes. The central idea in the movement is the comfort and convenience of the housewife in the kitchen, and the company offers to have a kitchen wired for electric service with a two-outlet wall bracket, and to provide a 60-watt lamp and a 6-lb. electric iron, fully equipped and ready for use, for an initial payment of $1. The total cost of the installation and equipment is $12, the remainder being payable at the rate of a dollar a month. Not only have the women responded in numbers to the inducement and secured the comfort of electricity in the kitchen, but the attention attracted to the subject has resulted in at least half the customers buying additional wiring and equipment. The idea originally entertained was that if householders learned the usefulness of electricity in the kitchen, they would later extend the service to the rest of the house; but the contractors who make the installations for the company have, as mentioned in a large number of cases, secured the orders for the larger work at once. The $12 barely covers the actual cost of the work, but the campaign has already been thoroughly successful in adding customers to the lines of the company.

New England Electric-Vehicle Business Growing

Signs of an increased demand for electric vehicles and industrial trucks are apparent in New England, after a somewhat quiet summer in this branch of the industry. Two new machines, one of 5-ton and one of 0.5-ton capacity, have just been purchased by the New England Confectionery Company, Boston. The lighter outfit will be used in the company's banking affairs and in making quick deliveries of special orders. Two 2½-ton trucks have lately been purchased by Brown & Wales, dealers in rolled steel and iron, Boston, and the Pittsburgh Plate Glass Company has ordered two 2-ton trucks. The Tallulah Paper Company, Fitchburg, Mass., Lowell Bleachery, Claremont (N. H.) Gas Company, the Pairpoint Corporation, cut-glass dealer, New Bedford, Mass., the J. V. Spare Dry Goods Company, New Bedford, and the Outlet Company, a large department store in Providence, R. I., have just purchased electric trucks, the last-named concern having ordered seven machines of from 1500-lb. to 2-ton capacity for retail city deliveries. A large garage equipped to care for both gasoline and electric cars will shortly be completed by this house, the gasoline cars being used only on the suburban long-distance work. One electric-vehicle dealer in Boston has sold six industrial trucks within the past week, and inquiries are increasing regarding prices and equipment. A number of industrial concerns owning electric trucks are having their equipment overhauled in anticipation of an early resumption of rush business. New rates for electric-vehicle battery charging have been put in force at Providence and by the New London division of the Connecticut Power Company. The Copley-Plaza Hotel has leased its ballroom for a passenger-car salon to be held this fall, and meetings of the Electric Motor Car Club of Boston will probably be started soon.

An Electrical Appeal to the Tourist

An energetic campaign has been waged during the present summer by the Cumberland County Power & Light Company, of Portland, Maine, to develop the use of electrical conveniences by tourists, thousands of whom visit Portland during the vacation period. In general the local hotels and boarding houses are liberally wired for electric service, and Portland is well provided with these accommodations, for the city is one of the chief points of departure for coast resorts and the White Mountain region besides being an attractive summer residence town in itself. The company shares its appliance-exchange store with the local board of trade, which runs an information bureau and tourist registry directly opposite the table shown in the accompanying photograph. Toaster stoves, immersion heaters, shaving mugs, curling irons, heating pads, milk warmers, disk stoves and flash-lamps find a ready sale in this store, which is comfortably equipped with easy chairs and other aids to the weary traveler. The demand for electric curling irons has at times threatened to exceed the supply. A miniature electric sign above the table is an effective part of the equipment, and the large number of daily visitors to the establishment affords the company excellent material for missionary work in the ever-widening field of electric service.

ELECTRIC REMINDERS FOR VACATION TRAVELERS

Electrical Equipment of a City Asphalt Plant

Many cities operate plants producing asphalt mixtures for street-paving repairs, but few of these plants are driven electrically, as is the new one belonging to the city of Chicago. Essentially this plant consists of huge kettles for melting the raw asphalt and mixing apparatus for combining the melted material with sand and stone to produce the asphalt pavement.

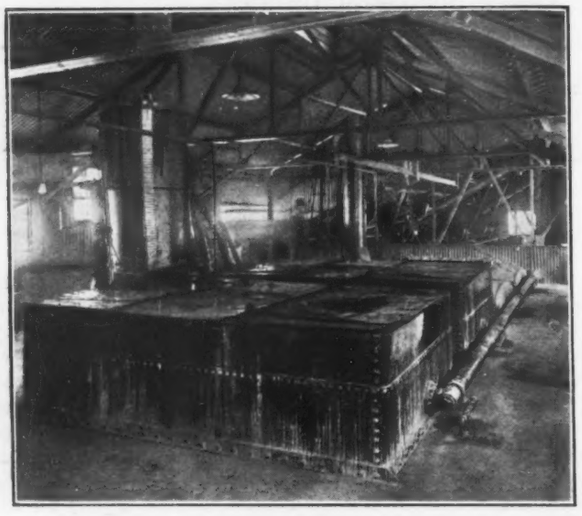


FIG. 1—KETTLE ROOM, SECOND FLOOR

Arriving at the plant, the raw asphalt is hoisted electrically to the kettle mouths, heated in oil-fired kettles, and conveyed to motor-driven mixers, where it is added to proportionate amounts of the other pavement ingredients. As shown in the accompanying table of motor applications, the handling of practically all the material is accomplished by motor-driven machinery.

Energy for operating the installation is supplied by the Sanitary District of Chicago over a three-phase, 2200-volt, sixty-cycle line. Mr. Frank Galligan, foreman, says that with the plant producing fifty to seventy-

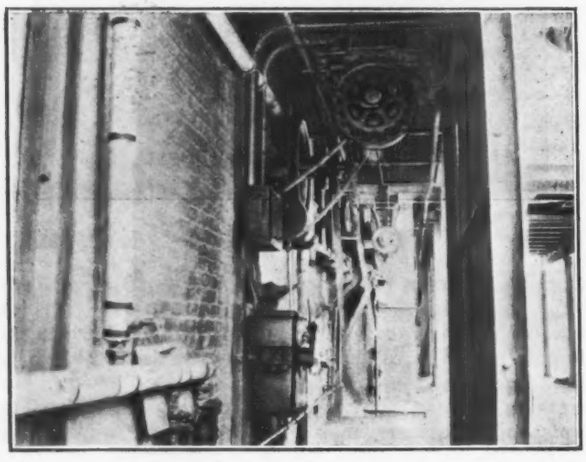


FIG. 2—75-HP MOTOR DRIVING AGITATOR PADDLES

five wagon-loads of pavement material a day the large motor (which drives a line shaft from which several machines are operated) requires about 28 kw. This machine is started at about 5 a.m., but is seldom in service after 3 p.m. The 7.5-kw motor driving the agitator paddles operates twenty-four hours a day. The others run intermittently.

In the contract between the Sanitary District and the city of Chicago the present connected load of the municipal asphalt plant is put down at 87.5 hp. The city agrees to pay at the rate of $2.20 per hp of the maximum demand, plus $22.05 a month to cover fixed charges.

The asphalt plant was built for the city by Hetherington & Berner, Indianapolis, Ind., at a cost of about $46,000, and can be utilized for the manufacture of top, binder and bituminous mixtures. Its rated output is 2000 sq. yd. of finished pavement (2 in. top and 2 in. of binder) per twenty-four-hour day. The operating force consists of about thirty men. The storage bins hold 860 cu. yd. of sand and stone and 500 barrels of cement.

MOTOR APPLICATIONS IN CHICAGO ASPHALT PLANT

Motor Rating in Hp	Applications
50	24-ft. by 3-ft. sand drum. 24-ft. by 3-ft. stone drum. Five belt conveyors, total 120 ft. in length. Two 9-ft. mixers. Two 8-ft. screens (mesh, No. 8 and No. 1).
7.5	Paddles in two agitators.
10	2.5-ton elevator.
20	10-ton elevator.

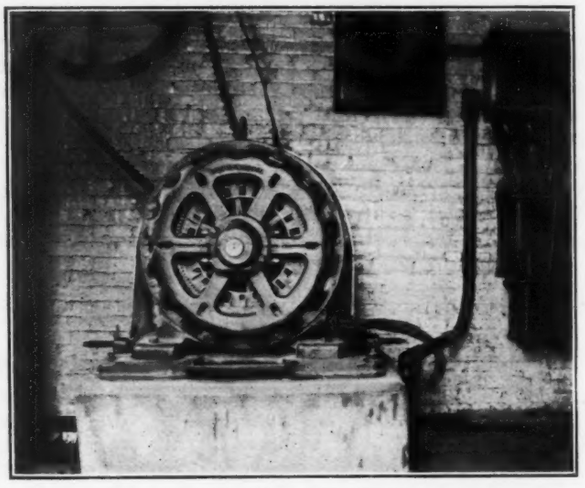


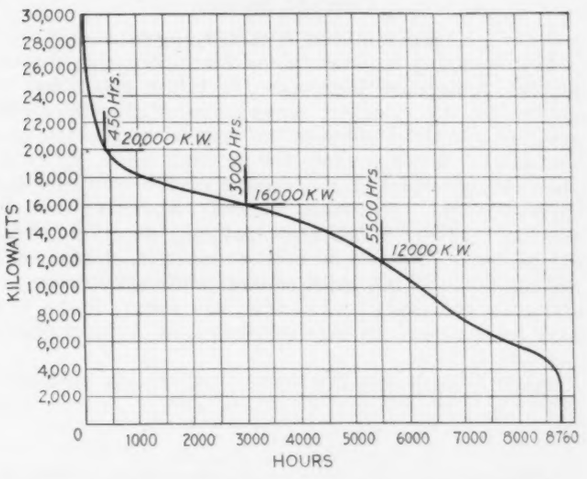
FIG. 3—50-HP MOTOR DRIVING LINE SHAFT

From the storage bins the material is carried by conveyors to the hoppers at the top of the plant. From these hoppers it is fed to the different mixers as required. After mixing, the product is conveyed to the wagons and arrives on the job at a temperature of from 280 deg. to 320 deg. Fahr. The plant is in charge of the Chicago Bureau of Streets, of which Mr. Walter G. Leininger is superintendent.

Some Revelations of the Load-Duration Curve

Much interest was aroused at the recent Philadelphia convention of the N. E. L. A. by Mr. J. C. Parker's reference to the load-duration curve as a means of investigating the efficient operating conditions of a central-station system. Reproduced herewith is the load-duration curve for the Rochester (N. Y.) Railway & Light Company, of which Mr. Parker is electrical engineer. The curve shows the relation between the load carried and the number of hours in the year for which

the load endures. For example, only about 4000 kw of load continues every hour in the year. The equipment necessary to carry 12,000 kw is used 5500 hours per year. But, on the other hand, of the 30,000 kw in plant installed, two-thirds is used less than 450 hours per year, or an hour and a quarter a day. Figuring this



LOAD-DURATION CURVE OF ROCHESTER COMPANY

equipment at $500 per kw, including plant, lines, etc., the investment required to serve this short-time demand is $5,000,000. Allowing 15 per cent for interest, depreciation and insurance charges, the cost of keeping this equipment ready is $750,000 per year, which is the equivalent of a tax of nearly $60 per year on each of the Rochester company's 13,000 electric customers.

Preparing for Fall Lighting Activity

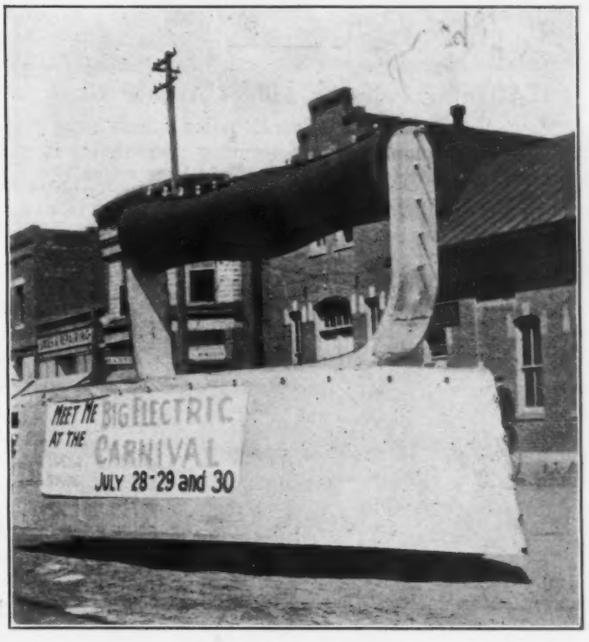
The striking newspaper advertisement reproduced herewith was run in local newspapers last fall by the Worcester (Mass.) Electric Light Company during its

NEWSPAPER ADVERTISING USED IN HOUSE-WIRING CAMPAIGN

house-wiring campaign. The display attracted much attention outside as well as within the company's territory. The essential features of the wiring-on-instalment plan in force during the month of September were easily explained to prospective customers over the telephone, and the method of emphasizing the instalment feature in the blocked-out advertisement by type set on an angle as shown was most effective in catching the reader's eye.

An Electric Carnival in War-Riddled Walsenburg

Almost as if under the auspices of the United States army, then patrolling the town, the Trinidad (Col.) Electric Transmission, Railway & Gas Company recently conducted a successful electric show at Walsenburg, Col. The federal troops were at the time encamped in the city to preserve order during the coal strike, yet despite the facts that the town was under martial law and that it had been battered by shot and shell from miners, mine guards and troops alike, the electric carnival proved a huge success in every way, amply justifying the enterprise of its promoters.



ELECTRIC-LIGHTED FLOAT ADVERTISING WALSENBURG CARNIVAL

Soon after the pacification of the Walsenburg district, following the arrival of the troops, Mr. Franklin P. Wood, manager of the electric company, decided that, despite all handicaps, such a carnival would "liven" up the city and help bring it back to its natural state. The strike, and matters before the strike, had engendered antagonistic feeling among the business men, splitting up the citizens into factions. Though the show was given primarily to encourage the use of electricity, it worked to produce a closer spirit of co-operation between the business men and helped to broaden the public policy of the electric company.

An electrically cooked luncheon for business men, served on the first of the three days, was attended by all factions, who broke bread together and then and there "buried the hatchet." Plans for a commercial club were formed, and now apparently all is serene with the local business interests.

The show was held under the management of Mr. Franklin P. Wood, general manager of the Trinidad Electric Transmission, Railway & Gas Company, who was assisted by Messrs. W. P. Wooldridge, H. H. Hoyt, S. J. Ballinger, H. J. Reed and W. R. Shade, the latter local manager at Walsenburg.

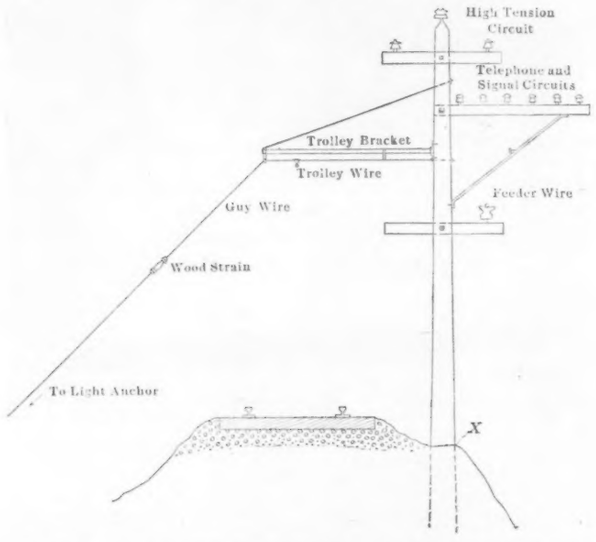
Illumination and Wiring

Lighting of Subway Crossings Beneath Railroad Tracks

In Chicago there are 830 "subways" where streets pass beneath railroad tracks elevated above grade. Much attention has been given to the lighting of these crossings by the Chicago department of gas and electricity. Research into track-elevation ordinances showed that 420 of these subways are to be lighted by the city and 410 by the railroads. As the result of a study of the proper illumination of the subways it was determined that the standard should be one 16-cp incandescent lamp for every 400 ft. of area under the subway. In the city-lighted subways the standard lighting unit is a 25-watt (20-cp) tungsten lamp. Lamps are suspended over the center line of sidewalks, while the roadways are lighted from reflectors at a 45-deg. angle supported on the curb-line pillars.

Aligning Poles by Aid of Anchor Guys

Many line foremen can recall poles which have given trouble on account of their seeming persistence in getting out of alignment. In most of these cases the set-



MAINTAINING ALIGNMENT OF POLE BY THE USE OF ANCHOR GUYS

ting of the poles has been done improperly or the character of the soil is such as to prohibit satisfactory pole-line installation. Such a line is shown in the accompanying sketch, the poles, carrying high-tension, trolley and auxiliary circuits, being set too near the edge of the embankment for stability.

As the earth behind the pole becomes soft in wet weather the pole has a tendency to lean away from the track, for as vibration at right angles to the line is set up by winds or passing cars the earth at *X* offers little resistance in a longitudinal direction. After such a pole has once settled toward the right from its perpendicular position its own weight tends to increase the trouble.

To correct this condition a transmission and railway company in northern Illinois has adopted the expedient of attaching a guy wire to the end of the mast arm, tying it to a light anchor which can be quickly and cheaply installed. With this wire drawn taut while the pole stands upright no difficulty is experienced in keeping the poles in line and the line is given an added factor of safety against wind.

Wire Tables for Alternating-Current and Direct-Current Motors

By William Sheriff Jones

In comparing various tables for alternating-current motors, it appears that both the tables assembled together by the Western Association of Electrical Inspectors and those given in the "American Electrician's Handbook," which provide for starting fuses, give current ratings which are in excess of the safe carrying capacity of the wires recommended. Assuming the connections shown in the accompanying diagram, which are probably intended by both authorities, *A* representing the fuses at the point of distribution where the installation consists of more than one motor, *B* the running fuses and *C* the starting fuses, the *A* fuses should

TABLE I—DATA FOR 220-VOLT, THREE-PHASE MOTORS

220-Volt Three-Phase Motors, Hp	A. E. Handbook		W. A. E. I.		X	
	Starting Fuse, Amp	Size Wire, B. & S.	Starting Fuse, Amp	Size Wire, B. & S.	Starting Fuse, Amp	Size Wire, B. & S.
1.0	10	14	10	14	15	14
2.0	15	14	20	12	15	14
3.0	25	12	30	10	20	12
4.0	.....	.....	40	8	25	10
5.0	35	10	50	8	25	10
7.5	45	8	60	6	50	6
10.0	65	6	75	4	50	6
12.5	.....	.....	.....	.....	70	4
15.0	100	4	100	3	80	3
20.0	130	2	140	2	100	1
25.0	150	1	175	0	125	0
30.0	200	0	200	0	150	00
35.0	200	0	250	00	175	000
40.0	225	00	275	000	225	0000
50.0	250	000	350	250,000 circ. mil.	235	250,000 circ. mil.

not be larger than the safe current-carrying capacity of the circuit wires and must be large enough to allow passage of the starting current without blowing. The function of the *C* fuses is performed by the *A* fuses, and therefore the *C* fuses are of no value. In some cases it is found desirable to have at *B* fuses of such capacity as to protect the motor itself and not the wiring to the motor, and these fuses would naturally be smaller than those at either *A* or *C*.

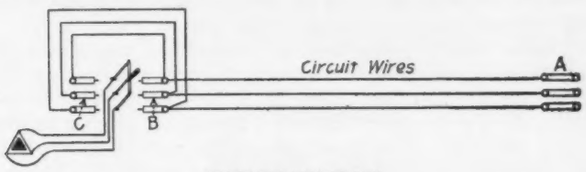
In Table I is given a tabulation of data for 220-volt,

TABLE II—RATING OF N. E. C. STANDARD FUSES

Rating, Amp	Indefinite Carrying Capacity, Amp	50 per Cent Overload	
		Amp	Time Before Operating
15	16.5	22.5	30 sec.
20	22.0	30.0	30 sec.
25	27.5	37.5	30 sec.
50	55.0	75.0	1 min.
65	71.5	97.5	2 min.
80	88.0	120.0	2 min.
90	99.0	135.0	2 min.
125	137.5	187.5	4 min.
150	165.0	225.0	4 min.

three-phase motors as proposed by the authorities given above. It will be noticed that in the first two columns the starting fuses for machines with ratings of more than 2 hp have a greater capacity than is re-

quired for protection of the respective wires recommended. Code standard fuses are made to carry indefinitely a current 10 per cent greater than that at which they are rated, and they will carry 50 per cent



WIRING DIAGRAM

in excess above the rating as is specified in Table II.

In calculating the running current for a three-phase, 220-volt (E), 10-hp induction motor, assuming a power-

TABLE III—EFFICIENCY OF POLYPHASE MOTORS (STANDARD HANDBOOK)

Hp	1	5	20	300
Efficiency	0.80	0.85	0.88	0.93

factor of 80 per cent (K), an efficiency of 86 per cent and a load of 100 per cent,

$$I = 746 \times 10 \div (381.04 \times 0.80 \times 0.86) = 28.5.$$

Referring to Table I and Table II, it will be found

TABLE IV—EFFICIENCY OF DIRECT-CURRENT MOTORS ON 110-VOLT AND 220-VOLT CIRCUITS (STANDARD HANDBOOK)

Hp	0.5	1	2	3	5	7.5	10	15	20	25
Efficiency	73	77	82	83	84	86	86	86	87	89

that if 50-amp fuses are used, which would have a maximum continuous rating of 55 amp and a rating of 75 amp for one minute, there will be an allowance for starting current of 263 per cent of running current for

TABLE V—DATA FOR ALTERNATING-CURRENT AND DIRECT-CURRENT MOTORS

(Sizes in B. & S. gage or circ. mils.)

Hp	Efficiency, per Cent		D. C. 110 Volts	D. C. 220 Volts	D. C. 500 Volts
		SINGLE-PHASE		THREE-PHASE	
		A. C. 110 Volts	A. C. 220 Volts	A. C. 220 Volts	A. C. 440 Volts
0.5	73	14	14	14	14
1.0	77	10	14	14	14
2.0	82	6	10	14	14
3.0	83	4	8	12	14
4.0	83	2	6	10	14
5.0	84	1	6	10	14
7.5	86	00	3	6	12
10.0	86	0000	1	6	10
12.5	86	300,000	0	4	8
15.0	86	400,000	00	3	8
17.5	86	500,000	000	2	6
20.0	87	500,000	0000	1	6
25.0	89	700,000	250,000	0	4
30.0	89	900,000	350,000	00	4
35.0	90	1,100,000	400,000	000	3
40.0	91	1,300,000	500,000	0000	2
50.0	91	1,700,000	700,000	250,000	0

one minute. As a load of 100 per cent is not generally obtained until normal running speed has been reached, this would seem sufficient for most practical purposes.

The "X" column of the table is based on the following equations as to carrying capacity of wires required:

110-volt single-phase alternating current = 2×110-volt direct current, or 4×55-volt direct current;

220-volt single-phase alternating current = 110-volt direct current;

220-volt three-phase alternating current = 220-volt direct current;

440-volt three-phase alternating current = 550-volt direct current.

On the basis of the above have been calculated the current and size of wire required for a 10-hp, 220-volt, three-phase motor. According to the foregoing equations, this motor would require the same size of wire as is required for a 10-hp, 220-volt direct-current motor at 125 per cent load and 86 per cent efficiency, and this wire would have a safe carrying capacity as follows:

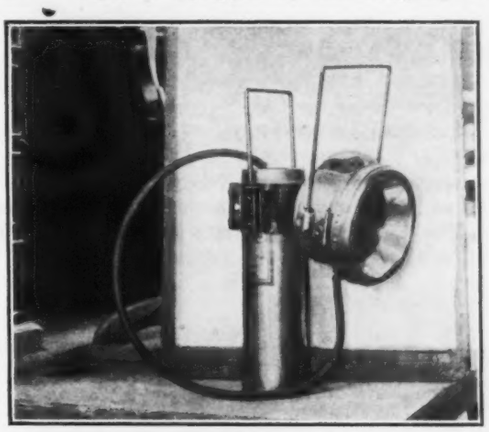
$$I = 9325 \div 189 = 49.$$

A No. 6 B. & S. gage wire would satisfy this requirement.

Figures given in Table III and Table IV for efficiencies of commercial motors were obtained from the standard handbook. These tables form the efficiency basis for the calculation in Table V, which shows a proposed tabulation for alternating-current and direct-current motors. The size of the conductors is given in B. & S. gage. The calculations for direct-current motors are based on a load of 125 per cent. A reasonable allowance for starting current is made for alternating-current motors, and the overload time-limit of fuses also receives consideration. Where the wires under this table would be "over-fused" in order to provide for the starting current, as may be the case with certain types of motors or certain kinds of connected load, the wires must be of such size as to be protected by these larger fuses.

Inspecting Transmission Lines with Gas Lamp

On the 38,000-volt transmission circuits of the Cumberland County Power & Light Company, Portland, Maine, line troubles are effectively hunted at night by the use of a motor-cycle head-lamp equipped with a Prestolite tank and flexible gas hose as shown in the accompanying half-tone. The tank, 4 in. in diameter and 13 in. high, is equipped by the company with a

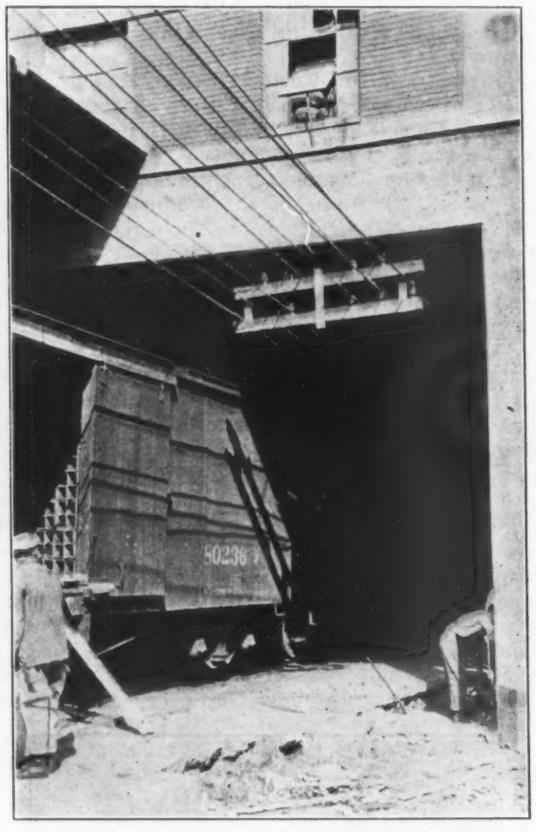


ACETYLENE HAND-LAMP FOR LINE INSPECTION

clamp 3 in. wide, bales being provided for the tank and reflector lamp to facilitate handling. The bales are of 5-16 in. brass wire. The reflector is 4 in. in diameter and the entire outfit weighs about 15 lb. In night inspection work the apparatus is especially useful in illuminating insulators, tie wires, etc., from the ground level.

Meeting Difficulties with Temporary Construction

Recent extensions of the Quaker Oats Company's factory at Cedar Rapids, Ia., necessitated the erection of a covered passageway over an intervening street at the second-story level. It so happened, however, that a lead of 35-ft. poles carrying several heavy high-voltage lines occupied the portion of the street at the second-story level, forming an obstruction which not only had prior rights but which could not be moved to another site without involving considerable work. Meeting the improvement half way, however, the central-station men removed the obstructing poles and resorted to the method of support shown in the illustration herewith to hold the cross-arms in place till the cables were either placed underground or re-routed. Cleats nailed to the cross-arms at their ends and in the middle held



TEMPORARY CONSTRUCTION AT CEDAR RAPIDS

them separated at the desired distance. Using wood strains as insulators, the framework of cross-arms and cleats is held suspended by wires extending from the top arm to eye-bolts in the concrete above.

Separation of Lighting and Telephone Wires

Officials of the Lexington (Ky.) Utilities Company and of the Fayette Home Telephone Company, of Lexington, have agreed on plans for the separation of the lighting and telephone wires on the city's streets, according to an agreement filed for the approval of the Board of Commissioners. The plan provides that all of the telephone wires shall be assembled on those sides of the streets on which they are now in the majority, while the same arrangement holds for the lighting conductors. The agreement as drawn up covers all of the streets, subject to the approval of the commission.

Recent Telephone Patents

A device patented by Mr. R. J. Robison, of Romulus, Okla., is called a telephone cut-off. It provides means whereby a party line may be cut in two for use in case the desired station is on an idle section. The restoring of the hook switch reconnects the line.

Some twenty years ago a transmitter was patented in which a closed helical spring of carbon served as the microphonic member. Mr. R. S. M. Mitchell, of Syracuse, N. Y., has now adapted a flat spiral spring to the same purpose. The inner or middle end of the spring is attached to the diaphragm and the outer to a carbon block. As the diaphragm vibrates, the spring is pulled more or less out of its normal plane, with the result that the number of convolutions in direct contact is varied accordingly.

Letter to the Editors

Building a Competing Plant

To the Editors of the Electrical World:

SIRS:—Should a concern whose sole business is engineering and construction work accept a commission from a city government to build an electric-service plant—or other public utility—to be owned and operated by the municipality and to compete directly with a similar plant, privately owned, in the same city which has been established and in successful operation for several years?

That is a question that may confront, almost any day, almost any large corporation engaged in the building of public utilities. It came before the chief executives of one such concern recently. Two sessions and several hours of debate were required to reach a decision.

The proposition was tempting. The engineering and contracting company was informed that it could have the contract on the basis of cost plus a certain percentage. The city was large and in good financial condition. Payment for the work seemed sure of being prompt.

Yet, on the other hand, there was the privately owned plant which represented an investment of a large sum of money. Investigation showed that it had been making only a reasonable profit ever since it had been installed. The service it was furnishing was of the best and the prices it was charging were reasonable—the market rates for similar service in that region. There was no economic reason or necessity for another plant. The only excuse that the municipality's representative gave for the city's going into the electric business was that, with its own plant, the city thought it could save money.

It seemed a profitable and desirable contract from the ordinary engineering and contracting point of view. The concern to which it was offered had no personal or financial affiliations with the owners of the plant already in operation.

But, after long deliberation, the corporation receiving the offer from the municipality decided to refuse it. Some of the executives argued that the company was in business to get all the orders it could. Others pointed out that the company, like most others in the field, was opposed to the idea of municipal ownership of public utilities, and that it would not be consistent to accept the offer—that there were other questions besides "Will it pay?"

Is not this attitude toward municipal ownership one that will be as untenable in the long run as that of King Canute toward the Atlantic Ocean? Perhaps some of your readers have ideas on the subject they will be willing to express.

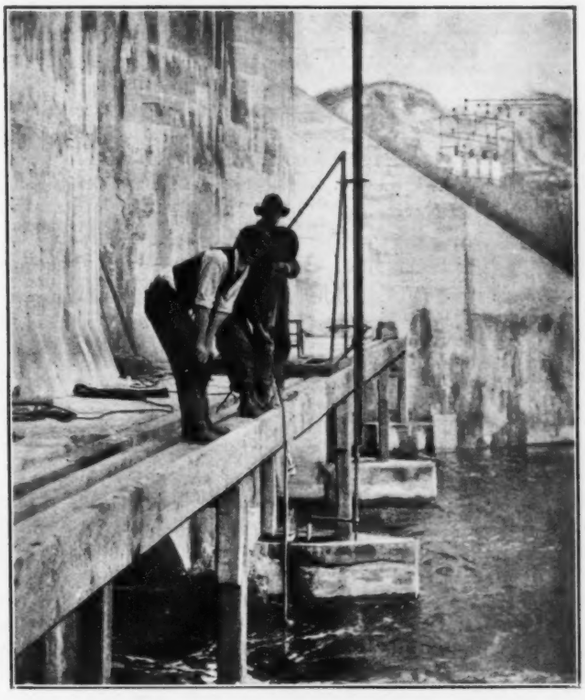
New York. T. D. DAY.

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Consumption of Low-Head Turbine Determined by Titration Method

The titration method of measuring fluid discharges which has been employed successfully in determining the water consumption of high-head turbines was used recently for the first time with satisfactory results in an open-flume short-draft-tube hydroelectric plant. The test was made on a 7200-hp eight-runner horizontal water turbine operating at 225 r.p.m. under a head



SAMPLING WATER AT TAILRACE

of 39.5 ft. at the Croton (Mich.) plant of the Grand Rapids & Muskegon Power Company.

The titration method of measuring fluid flow consists of injecting a salt solution of definite concentration and under a constant head into the tube conveying the fluid to be measured, and comparing the concentration of the original salt solution with that in the discharge tube after thorough and uniform mixing has been allowed to take place. The unit flow through the discharge tube may then be computed by multiplying the rate of flow from the solution tank by the ratio of the concentration in the tank to that in the tube.

As the flumes of the plant tested were open and the draft tubes were only 40 ft. long, the salt solution was injected directly into the turbine through four nozzles and samples of the diluted solution were taken out at the outlet of the draft tube. It was found by analysis that the percentage of salt in different samples taken from the draft-tube outlet did not vary more than 1 per cent. This showed that the solution disseminated itself uniformly through the discharge water, even in the short distance, hence proving that the titration method could be relied on in measuring the discharge.

On comparing the results thus obtained with the unit flow measured by Epper-Ott screw-type current meters, a difference of only 1.3 per cent could be detected.

A Year's Electrical Accidents in Chicago

One of the important functions of the Bureau of Electrical Inspection of the Department of Gas and Electricity of the city of Chicago is the investigation of electrical accidents to reduce the life-and-limb hazard. Commissioner Ray Palmer, in his recent annual report, says that the time has come when some decided action must be taken to reduce the number of electrical accidents. He points out that fifteen children were killed in Chicago last year by electrical accidents. The department has undertaken an investigation having for its object the formulation of rules which shall tend to reduce accidents on pole lines from electrical causes. Later the investigation may be extended to indoor electrical work. Mr. Palmer says that the department should be empowered to prevent the sale of dangerous electrical appliances, meaning possibly appliances that are not properly made or "fool-proof" rather than any fixed class of apparatus.

Many of the accidents to children are caused by climbing poles to high-potential wires on a "dare." A few records of other accidents may prove useful:

"Jan. 2, Walter Link, age thirty-two, assistant engineer, while operating field rheostats, preparing to cut in another generator, was killed. The 110-volt exciter circuit was grounded. One of the rheostat hand-wheels was grounded, and the other not. The operating chain of the ungrounded hand-wheel touched a live contact on rheostat while deceased had hands on the two rheostat wheels. His hands were wet, and he was unable to release himself."

"March 24, Joseph Ruthowski, age twenty-eight, electrician, while replacing insulators for railway storage battery, accidentally touched battery with that part of his arm above his rubber glove, and received shock which killed him."

"March 24, Thomas Giranowicz, age thirty-five, came out of barn, and evidently attempted to push out of the way a wire that was hanging down, and received a shock which killed him. The primary wire of a 2300-volt circuit had broken down during storm."

"May 27, Mrs. William Smith, while pumping water, touched a charged electric meter with her arm, and received severe burns. The primary insulation of the transformer feeding the house had broken down; voltage 2300."

"May 31, George W. Krummer, age twenty-one, while in a bathtub, was using an electric vibrator attached to a lighting circuit. He received a shock, was unable to let go of the vibrator, and was killed. The vibrator was of a type necessitating a lamp in series with it on a 110-volt circuit. A wire had broken off one of the brushes of the motor, and the person who made the repairs had left the wire grounded to the frame of the machine."

"Aug. 21, Charles Haug, age thirty-three, steamfitter, was unscrewing pipe and in so doing pushed it against a drop cord on a 220-volt two-wire direct-current circuit. The rough sides of the pipe cut into the insulation of the cord. He received a fatal shock."

"Oct. 31, Norman L. Campbell, aged fifteen, attempted to remove a tungsten lamp from series street-lighting system, and received a fatal shock. Voltage 4250."

"Nov. 14, Michael Tolend, age twenty-seven, painter, climbed a tower supporting spans of 6600-volt circuit at a river crossing, came in contact with one of the wires and was killed. He climbed the tower for a view of surrounding country."

The accompanying table contains a summary of accidents for the year 1913.

SUMMARY OF ELECTRICAL ACCIDENTS

	Persons Injured				Injury			Voltage		
	Employees	Others	Minor	Adult	Slight	Serious	Fatal	Low	High	Extra High
Street-car accidents:										
Injured by controller flash	12	..	..	12	12	..	..	12	..	..
Shocked while adjusting trolley	7	..	..	7	7	..	..	7	..	..
Flash from canopy switch	5	..	..	5	5	..	..	5	..	..
Blowing of fuse	10	..	..	10	9	1	..	10	..	..
Broken trolley wires	..	1	..	1	1	..	..	1	..	..
Burned or shocked other than above	10	..	..	10	9	1	..	10	..	..
Short-circuit or flashover:										
Operators	17	..	..	17	14	3	..	13	..	4
Electricians (inside)	28	..	..	28	26	1	1	28	..	..
Meter men	25	..	..	25	25	..	..	25	..	..
Cranemen	8	..	..	8	8	..	..	8	..	..
Linemen or repairers	18	..	..	18	15	3	..	10	7	1
Others, not electricians	13	..	2	11	12	1	..	13	..	..
Accidental contact:										
Repairmen (inside)	3	..	..	3	3	..	..	3	..	..
Electricians and station employees	8	..	..	8	3	4	1	6	..	2
Linemen and troublemen	20	..	1	19	8	5	7	6	12	2
Trespass, climbing lamp-poles	..	15	12	3	2	7	6	..	..	15
Trespass, interfering with wires	..	4	3	1	1	2	1	1	2	1
Persons at work near live circuits	16	..	1	15	7	3	6	15	..	1
Broken wires	1	7	1	7	3	1	4	..	7	1
Defective wires	3	1	..	4	3	..	1	3	..	1
Crossing of power with other wires	2	5	..	7	5	2	..	1	2	4
Shocked from electric vibrator	..	1	..	1	..	..	1	1	..	..
Miscellaneous	2	..	..	2	2	..	..	2	..	..
Totals	208	34	20	222	180	34	28	180	30	32

Drawing Plans to Scale

In marking the location of electrical apparatus or any other machinery, it is particularly desirable that the plan on which the apparatus is shown should be drawn to scale.

The architect, for instance, develops a plan. Subsequent alterations may possibly be made by the change in a dimension but without redrawing to scale the part affected. The plan then goes to the electrical engineering department. This department will proceed to distribute on the plan the various power apparatus. Bits of cardboard representing each piece of apparatus and drawn to the same scale as the plan are temporarily pinned to the sketch in the positions desired to find proper clearances.

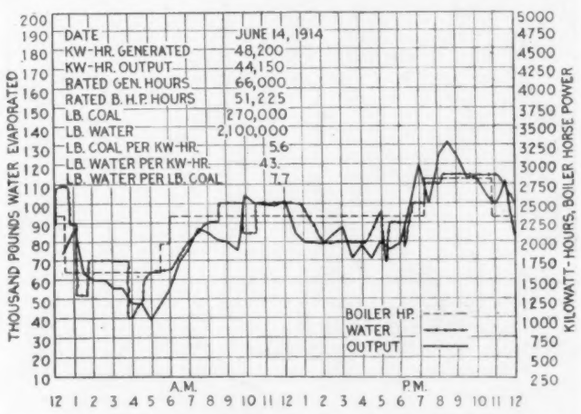
A switchboard, for example, is so placed that apparently it does not obstruct an adjacent doorway. This may not prove true, however, if the dimension for the doorway has been increased or decreased.

No doubt the architect and the engineer are both equally responsible for any resulting error. Nevertheless, protection at the source is the best, for an error in the field usually involves the expenditure of considerable money.

Interesting Firemen in Boiler-Room Economy

In order to stimulate the interest of the firemen at the Danville (Ill.) station of the Illinois Traction System, a curve sheet such as is shown in the accompanying illustration is posted in the boiler room each day. The three graphs on the cross-sectioned paper are drawn in red, black and green ink, the red line indicating the output in kilowatt-hours, the black line the boiler-horse-power, and the green line the thousands of pounds of water evaporated. By an ingenious arrangement the scale of the curve is such that all three curves should theoretically coincide. Under proper operating conditions the station evaporates about 40 lb. of water per boiler-hp-hour. The engine takes about 40 lb. of steam per kw-hour, so that the number of pounds of water per kw-hour of output should equal approximately 40. This simplifies the reading of the curve.

Mr. J. E. Johnson, manager of the company's Danville property, reports that after a month's trial he has found that the men in the various shifts watch the bulletin board closely, endeavoring never to let their own portion of the curve show results below those of the other crew. The curves may also be easily interpreted to show whether the correct number of boilers has been in operation. It has been found that this phase of the work pays well, for it is often easier for the firemen in a boiler room equipped with mechanical stokers to fire a larger number of boilers than necessary than it is for them to operate just the right number at full force.



CURVE SHEET SHOWING EFFICIENCY IN BOILER ROOM

In addition to the curves the daily fire-room sheet carries data showing the electrical output of the station and the amount of coal and water used.

Smoke from Chimneys of Oil-Burning Furnaces

Is it safe to assume that oil is burning properly when no smoke is being emitted from the chimney of an oil-burning furnace?
W. G. H.

The fact that smoke is absent is not a sure sign that combustion is perfect, although in connection with other indications such as a clear, bright flame and a certain roaring sound that is produced when the oil is being entirely consumed it usually signifies efficient operation. The supply of air to the burner may, however, be excessive, and in that case, though there is no smoke at the chimney, economical results cannot be obtained. It often happens in plants where converted furnaces are used that the fireman who has been used to coal-burning allows too much air to be intermingled with the oil. In order to determine whether too much air is being used the flue gases should be analyzed frequently or a continuous carbon-dioxide recorder should be used.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Testing Potential Transformers.—H. B. BROOKS.—A description of the method for testing transformers of which the novel feature is the use of facilities which are available in any properly equipped alternating-current power plant in addition to a potential transformer whose ratio and phase angle are known. From the practical point of view, an error in ratio or phase angle which produces a visible error in the reading of an indicating wattmeter is an error which should be known, while errors smaller than this are negligible. We may, therefore, use an indicating wattmeter in such a way that differences in ratio or phase angle of an unknown transformer and a standard transformer have the best possible opportunity to produce a deflection. By properly choosing conditions this deflection may be readily made to give the numerical values of the quantities desired. The primary windings of the standard transformer and the transformer to be tested are connected to the same supply, as shown in Fig. 1. The secondary windings

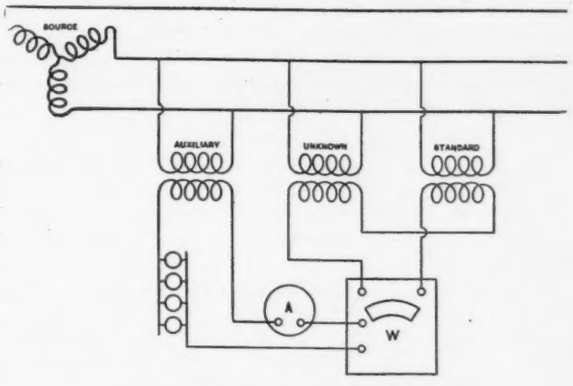


FIG. 1—DIAGRAM OF CONNECTIONS

are connected in series so that their voltages are opposed. The secondary voltages will be nearly equal and will rise and fall in unison as the line voltage varies. The thing to be measured is the difference between the two secondary voltages, which difference would in general be only a few volts. As the lower end of the scale of an alternating-current voltmeter is practically useless, this small voltage cannot be measured satisfactorily with even a low-range voltmeter. However, a 5-amp indicating wattmeter may be used as a voltmeter by separately exciting its current coil. This may be done by passing 5 amp through the coil to a lamp load. This exciting current must not be drawn from either of the two transformers whose ratios are to be compared, but must come from the secondary of some other available transformer connected to the same phase as the transformers under comparison. The current through the series coil of the wattmeter should be kept at approximately 5 amp, but this current needs to be measured with only moderate accuracy. The potential circuit of the wattmeter may now be used as a voltmeter to measure the small difference in the secondary voltages of the two transformers under comparison. For example, if the wattmeter is made for 5 amp, 150 volts, 750 watts, and has a 150-division scale, then one division is 5 watts and will be given by 5 amp in the current coil and 1 volt on the potential circuit; hence the difference between the two secondary voltages, in volts, will be shown by the number of division deflections of the wattmeter. Since the ratios of good voltage transformers change very little with ordinary fluctuations of line voltages, the difference of the secondary voltages will be practically constant. As the wattmeter reading is steady and can be taken to one-tenth of a division, the ratio of one transformer in terms of the other can be read to 1 in 1000. The question as to which transformer has the greater ratio may be easily answered from the fact that increasing the non-inductive load on the secondary always lowers the secondary voltage and thus increases the ratio of transformation. The above method is a suitable one for determining the regulation of power transformers, by using one transformer of a bank on no load as the standard transformer and determining the drop of voltage of another transformer as the load on it is increased. If the test for ratio is made with the primaries connected to one phase of a two-phase circuit, a determination of the difference of the phase angles of the two transformers may then be made by connecting the wattmeter series coil and 5-amp lamp load to the other phase. To determine which of the two secondary voltages is leading the other, use may be made of the fact that increasing a non-inductive load connected to the secondary of a potential transformer tends to make the reversed secondary voltage lag behind the primary voltage. Fig. 1 shows no connected load on the secondary of the transformer whose ratio and phase angle are to be determined. However, any desired load may be connected to it and the comparison made in the same way. The load is simply connected to the secondary terminals without disturbing any of the other connections. Tests in which this method was used show a close agreement with the results of an accurate laboratory method.—*Bulletin*, Bureau of Standards, Vol. X, No. 3, 1914.

Lamps and Lighting

Arc Lamps and Luminescent Lamps.—T. PAUSERT.—An article illustrated by diagrams giving brief descriptions from recent French patent specifications of new arc lamps and luminescent lamps.—*La Revue Elec.*, July 17, 1914.

Generation, Transmission and Distribution

Lightning and Surge Arresters.—An article on a new type of arrester of Pizzuti and Ferrari. Arresters arranged to protect an installation are useless if situated in the neighborhood of the nodal point of the pressure wave. To remedy this, Pizzuti and Ferrari have introduced the zig arrester, which has been designed from consideration of the laws by which oscillating disturbances are propagated in circuits. The speed of an oscillatory wave along a circuit may be stated as $\sqrt{1/(CL)}$, where C and L are the capacity and inductance of the conductor respectively. If the natural impedance has a constant value at every point of the line, the wave

is propagated without deformation or appreciable alteration. When the wave arrives at a point after which a fall of impedance occurs a partial reflection with change of sign and fall of potential takes place; the current phenomena are, however, the reverse of those for potential. If, on the other hand, the wave arrives at a point where a rise of impedance occurs, a partial

FIGS. 2 AND 3—LIGHTNING-ARRESTER CONNECTIONS

reflection without change of sign and a rise of potential takes place, the current phenomena being again the reverse of potential phenomena. The rise or fall of potential is greater the greater the variation of the natural impedance of the line. If the natural impedance of the circuit passes from a very small value to a very high one in consecutive sections, there occurs at the junction a total reflection of the wave. The potential, however, does not change sign at the reflection, but the current changes sign and thus a nodal point is formed. The contrary takes place in the case of passing from a very high natural impedance to a very low one. As, with aerial lines, the product of C and L has a nearly constant value, and the surges have a frequency of the order 10^4 to 10^5, corresponding to a wave-length of between 0.3 km and 3 km, it is sufficient to give to the protective apparatus capacity and inductance equivalent to 1.5 km of the line. If an apparatus is inserted in series in the line whose capacity and self-induction is equal to that of the part of the line between two successive nodes, all the values of the potential wave are discharged in the apparatus, and any surges will be discharged to earth, if suitable arresters are installed. The zig arrester shown diagrammatically in Fig. 2 consists essentially of a capacity AB, one part of which is connected to earth, while the other is in series with the line and a self-induction BC. AB has a very small natural impedance and BC a very large one. A surge passing along the transmission line is partially reflected at A and totally at B, and at this point the pressure rises above that of the line in consequence of the variation of impedance. If a discharge path is provided at B the protection of the system is assured; the energy of the surge wave will discharge not only through the lightning arrester at B, but also through the dielectric of the capacity AB. AB and BC are so proportioned that the time taken by the reflected wave to pass from B to C is equal to or greater than that required by the wave to pass from B to A, so that before the reflected part of the wave arrives at C it is discharged by the arrester at B, the excess voltage having already attained its maximum at B. In order to facilitate the discharge, several arresters are placed in parallel, and these are connected to earth through a resistance in the usual way. To protect an installation on both sides the arrangement shown in Fig. 3 is adopted, being a further development of Fig. 2. This method is reported to be very effective, not only for very high-frequency disturbances, but also for those of lower value such as might arise from the rapid breaking of a circuit. It can be applied to protect underground cables from surges. The zig arrester has been successfully employed in many important Italian installations and is constructed in four types—for 12,000 volts, 30,000 volts, 50,000 volts and 90,000 volts. It may be mentioned that among the installations in use the Societa Meridionale di Elettricita has applied them to its 30,000-volt transmissions and is fitting them to its 90,000-volt lines.—London *Elec. Review*, Aug. 14, 1914.

Traction

Electric Traction in Spain.—An illustrated article on the first electric railway in Spain. It runs between Linares and Almeria in the mining district of Santa Fé. The three-phase traction system is used with two overhead conductors and the rails as the third conductor. At the power station in Santa Fé three-phase currents are generated at 5500 volts. The three-phase induction motors on the train have a capacity of 160 hp or 220 hp.—*La Revue Elec.*, July 17, 1914.

Installations, Systems and Appliances

Rate for Electrical Energy.—G. DARRIEUS.—An article on the proposal of Riccardo Arno to charge not only for the real power but also to make a certain charge for the "wattless power." He defines the "complex power" as the sum of the real power plus k times the wattless power. The coefficient k may be, for instance, 0.23, which means that the consumer has to pay for wattless power 0.23 times the charge for real power. There is a simple means for measuring in any three-phase circuit the wattless power at the same time as real power if two meters connected according to the two-wattmeter method are employed. They may even be combined in the single instrument. If W_1 and W_2 are readings of the two meters, the total real power is $W_1 + W_2$ and the wattless power is $(W_1 - W_2) \times \sqrt{3}$, and the complex power as defined above equals $(1 + k\sqrt{3})\ W_1 + (1 - k\sqrt{3})\ W_2$. If k equals 0.23, we have $1 + k\sqrt{3} = 1.398$ and $1 - k\sqrt{3} = 0.602$.—*La Revue Elec.*, July 17, 1914.

Great Britain.—A. H. SEABROOK.—A review of the historical development of electricity supply in Great Britain, the various rates used, the methods employed for popularizing the use of electricity, and the cooperation of central stations with other industries.—*Elek. Zeit.*, July 9, 1914.

Wires, Wiring and Conduits

Aluminum Insulated Cables.—An article discussing the objections usually raised to the use of aluminum for insulated cables. The first objection is on account of expense. Admittedly the insulation and protection of aluminum conductors places a modified aspect on the question of economy, the larger diameter of the aluminum core postulating a relatively larger area to insulate. But the initial saving on the strand, even in the smaller gages, will as a general rule be found to meet this extra expense with a useful balance in hand, while it will be obvious that as the area of the conductor increases the greater does this economy become and the more apparent the advantage in specifying aluminum. It is true that heavily armored high-tension cable will not show aluminum to the same advantage, particularly when the cores are of relatively small cross-section. The second objection is the difficulty of jointing, but great progress has been made in this direction in recent years. The third objection is that its scrap value is low. Provided the cost of producing an aluminum cable be placed upon an equal footing with the copper equivalent, it will be found in practice that the profit gained in the first instance capitalized over the usual life of a cable, say, from twenty to thirty years, will more than meet any difference that may exist in the relative scrap rates of copper and aluminum. If we take into consideration the rating of cables, the advantages of aluminum cables are still more evident. Owing to the increased diameter, the relatively larger surface of radiation afforded by aluminum has been found in practice to permit of heavier currents for a given rise in temperature. Conversely, to carry the same current as a given copper conductor for an equal rise in temperature, the diameter of an aluminum core may be ap-

preciably less than that prescribed by considerations of conductance alone. Where voltage drop is the main question at issue, it is, of course, essential that the relative conductivities of the two metals be taken into consideration, when the required section will be 64 per cent in excess of copper. But where, as in the great majority of cases, the current to be carried is limited by the permissible temperature rise, an average increase of 36 per cent on the section allowed to copper will safely meet the general requirements of the estimator and will provide a more practical definition of an equivalent cable.—London *Electrician*, Aug. 14, 1914.

Electrophysics and Magnetism

Ponderomotive Force Upon Dielectrics.—R. H. GODDARD.—According to Lorentz's theory of a dielectric, a ponderomotive force must act upon such a body when carrying a displacement current in a magnetic field analogous to the force which is known to act upon a conductor when carrying a conduction current in a magnetic field. An experiment performed by Whitehead to demonstrate the existence of this force has given a negative result, which result has been shown by others to be in agreement with electrical theory. In the present paper the theory of a more general research is developed, which includes the Whitehead experiment as a special case and suggests, further, an experiment by which a positive result may be attained. An apparatus has been designed, on the lines suggested by this theory, whereby the quantities involved in a determination of the force in question may be obtained with a considerable degree of accuracy. An experiment, of a preliminary nature, has shown that the ponderomotive force, upon a piece of hard rubber as dielectric, is of the expected order of magnitude.—*Phys. Rev.*, August, 1914.

Electrochemistry and Batteries

Manufacture of Steel in the Electric Furnace.—SIGMUND GUGGENHEIM.—An English translation of his recent German paper on the development of the manufacture of steel in electric furnaces in recent years, with a discussion of the reasons why the commercial advances have been relatively slow.—London *Electrician*, Aug. 14, 1914.

Units, Measurements and Instruments

British National Physical Laboratory.—An abstract of the proposed work of the (British) National Physical Laboratory for the next year. The first instalment relates to the work in the fields of electricity, meteorology, optics and metallurgy and in the engineering department. A summary of the work done with the Lorenz apparatus, current weigher, resistance standards, magnetometer, magnetographs, standard cells, power-factors of condensers, inductance measurements, high-frequency measurements, high-frequency resistance and decrement measurements, effects of strain upon magnetization, magnetic permeability of iron, lapping of telephone cables, photometry, lighting installations, power measurements, heating tests of field coils, direct current and resistance measurements, conductor rails, heating of buried cables, and the electric emissivity of matter at high temperatures, is given.—London *Electrician*, July 3 and 10, 1914.

Telegraphy, Telephony and Signals

Wireless Telegraphy.—PAUL JANET.—An illustrated article on the system of teaching wireless telegraphy at the High School of Electricity in Paris. Various officers of the French army and navy have been instructed there.—*La Revue Elec.*, July 17, 1914.

Miscellaneous

Electric Photographs of Relief Designs.—A. PALME.—"Electric photographs" of metal relief designs, such as those on coins, can be obtained with the arrangement of Fig. 4, where *a* is the object to be photographed.

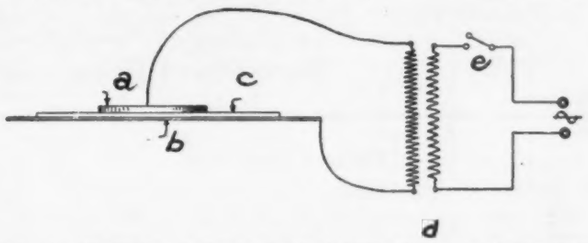


FIG. 4—DIAGRAM SHOWING ARRANGEMENT OF "ELECTRIC PHOTOGRAPH" APPARATUS

At *b* there is a metallic sheet and *c* is an ordinary photographic plate placed on the metal sheet *b* while the object *a* is laid on the emulsion of the photographic plate. The object *a* and the metallic sheet *b* are connected respectively to the terminals of a high-tension transformer. The pressure must be at least 5000 volts. When the switch *e* is closed and quickly opened again and the plate is developed, a negative picture of the object is obtained. The explanation is that between the object *a* and the sheet *b* a brush discharge takes place having associated with it ultra-violet rays which decompose the silver bromide in the photographic plate. The voltage of the transformer must not be so high that sparks are formed. A film cannot be used instead of the photographic plate since the dielectric resistance of the film would be so low that it would be quickly perforated with the formation of an arc.—*Elek. u. Masch.* (Vienna), July 12, 1914.

Book Review

FUEL ECONOMY AND CO_2 RECORDERS. By A. R. Maujer and Charles H. Bromley. New York: McGraw-Hill Book Company, Inc. 190 pages, 28 illus. Price, $1.50.

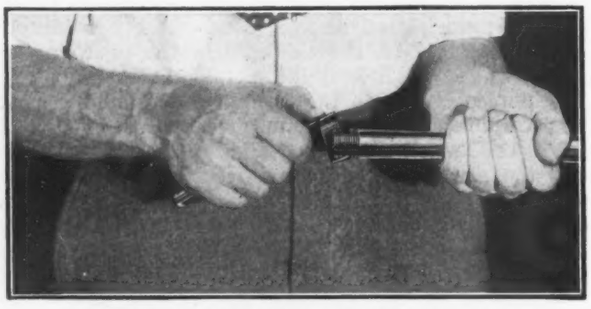
A home-study textbook is most difficult to prepare. To insure success the author must put himself, mentally, in the position of one who knows little of the subject to be treated, and he must foresee and explain away all the difficulties that the reader is sure to encounter. Such a book is written largely for the man whose early education is slight, and hence the language must be simple yet accurate. Again, the author should not try to write a treatise, but should confine himself to those topics on which the reader wishes further information to help him in his daily work. This book has been made up from a series of lessons that appeared in the engineers' study course in *Power*, and is intended as a home-study work. It begins with an explanation of the actions that take place during the combustion of coal and shows how to find the amount of heat developed and the weight of air required. Detailed instructions are given for the proximate analysis of coal. The use of apparatus for taking a flue-gas sample and making the analysis, and the method of finding the excess of air from the results of the analysis, are covered fully and clearly, and a final chapter is added to explain the principle of action of the continuous gas analyzer, or CO_2 recorder. The other chapters treat of draft and its measurement, chimney sizes, boiler horse-power, steam calorimetry, boiler efficiency, use of the heat balance in checking losses, and methods of testing and treating feed water containing impurities.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Thread Protector

Protectors for threads on its enameled pipe are being furnished by the Enameled Metals Company, Pittsburgh, Pa. These protectors are placed on the conduit immediately after the pipe is threaded, and they protect the threads from any injury during the



METHOD OF REMOVING THREAD PROTECTOR

processes of manufacture, shipping, handling, carting or placing on the job. Couplings are also protected during manufacture so that they are free from enamel on the inside. The protector can be removed by cutting it with a jack-knife, as shown in the accompanying illustration and peeling it off. The pipe is then ready to be screwed to a coupling.

Metal Carrying Cases for Electricians' Tools

Metermen, repairmen, wiremen and other electrical workers may be interested in the metal carrying cases or kits for tools illustrated herewith. These kits are made of sheet steel, but are said to be no heavier than leather bags of corresponding size, the average weight being given as between 5 lb. and 7 lb. They are brown in color, being triple-coated with baked enamel. Built to withstand hard usage, they are reinforced throughout and have Corbin locks, brass side-catches, leather-covered handles and iron corner-pieces. They resemble leather

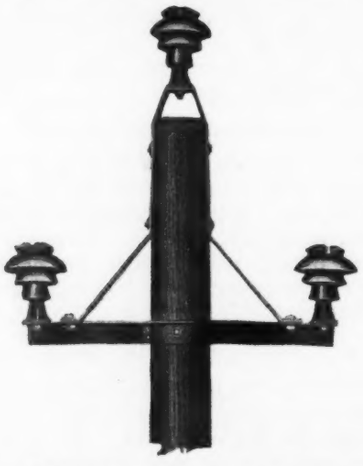
STEEL TOOL KITS

bags in appearance and can be made practically thief-proof, as they cannot be cut open easily. Pointed tools will not pierce the sides or bottom. The sides of the bag are smooth on the outside, no rivets showing. The construction is such that the weight is carried by the body of the bag, with no strain on the lids or hinges. The tray for small parts is made of aluminum and fiber. These steel kits are made in various sizes by the Kennedy Manufacturing Company, 14 East Jackson Boulevard, Chicago.

Steel Cross-Arms for Three-Phase Lines

The new angle-iron cross-arm, shown herewith, has on each side steel braces which are continuous and form a ridge-iron over the top of the pole for the third insulator. The cross-arm itself is so shaped as to bring the insulators on a line with the center of the pole, also centering the braces and the top insulator.

To install one of these "Keystone Triangle" cross-arms, as the device is called, it is only necessary to shave off two sides of the pole at the top so that the pole will fit the brace and to bore three holes. The cross-arm proper does not require gaining. All preparation can be very quickly and accurately made by means of a templet where a large number of poles are

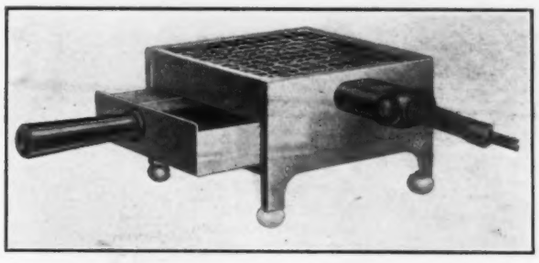


STREET CROSS-ARM FOR TRANSMISSION DELTA

to be erected. On account of the superior bracing qualities of the cross-arm only three ¾-in. through-bolts are required to secure it firmly to the pole. An important feature of the arm is its great strength, particularly against downward pulls, while the position of the bolts gives the arm exceptional rigidity. The wires are held in different vertical planes, thus decreasing the possibility of a short-circuit in case of the breaking of an upper wire. The maximum height of pole is also made useful since the ridge-iron serves as an extension. Ground-wire supports or bayonets can be attached by means of the two through-bolts which support the upper section of the triangles. The cross-arms are formed of 3-in. by 3-in. by 1-in. angle steel and ¼-in. by 3-in. flat steel. These arms are designed for three-phase circuits operating at pressures up to 35,000 volts and 50,000 volts, the respective sizes weighing approximately 36 lb. and 49 lb. The Electric Service Supplies Company, Seventeenth and Cambria Streets, Philadelphia, Pa., is the maker.

Electric Toaster Stove

An electric stove designed for toasting, frying, grilling, etc., is being placed on the market by the Rutenber Electric Company, Logansport, Ind. Two pieces of toast can be toasted at one time, one piece being placed above the heating element and the other below in the grill pan. When frying, the pan is removed

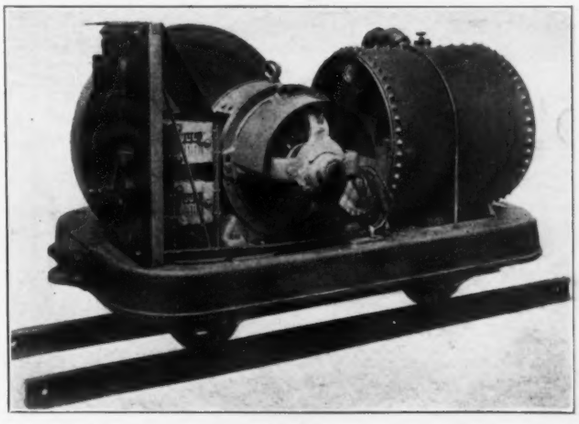


COMBINATION ELECTRIC STOVE

from beneath the coil and placed above on the frame. The body is designed so that the pan covers the entire top surface. The stove is equipped with a grid which fits into the pan. This grid can be adjusted to two heights and is used for grilling. This stove is finished in highly polished nickel.

A Portable Motor-Operated Compressor

The small motor-driven air compressor illustrated herewith is designed for use in mines, industrial plants, etc., to supply air for rock drills, hammer drills, pneumatic tools, coal-pick machines and post punchers. The apparatus can be mounted on a truck of any desired wheel gage and comprises a 15-hp Westinghouse motor, an air compressor, a storage tank and a motor-starting rheostat. The motor is of the moisture-proof type and will operate successfully, it is claimed, in the wettest portions of the mine. It is designed for either alternating current or direct current. The receiver is made of plate steel and is tested to withstand 100 lb. air pressure. It is equipped with a safety valve, pressure gage and blow-off or drain cock. The cylinder of the compressor is lubricated by a light-feed air-cylinder



PORTABLE MOTOR-DRIVEN AIR COMPRESSOR

lubricator, while the crank shaft and crosshead are served by the splash system. An unloading device on the air-inlet valves saves energy when the demand for air is less than the output of the machine. This compressor is being manufactured by the Sullivan Machinery Company, Chicago.

Hand Lantern Accommodating Ordinary Dry Cell

An electric hand lantern designed to accommodate the standard size of dry cell used for doorbell circuits is shown in the accompanying illlustration. The battery can be easily inserted by unscrewing the end cap. The incandescent lamp employed in this lantern requires only 0.25 amp and has a rating of about 2.5 cp. A silver-plated reflector and a ground lens concentrate the light rays into a small-angle cone of flux. Intermittent or continuous light may be obtained by respectively pushing or sliding a button. With a well-constructed dry cell this lantern will give continuous light for 100 hours. Used intermittently it will operate from six months to a year. The manufacturer declares that a cell no longer fit for ignition purposes can be used in this lantern. It is 9 in. long and 2.875 in. in

HAND LANTERN EQUIPPED WITH BELL-CIRCUIT DRY CELL

diameter and can be furnished in polished nickel-plated brass or rubber-finish steel. The device is being marketed by the Beers Sales Company, Bridgeport, Conn.

Wireless-Telephone Set

A radio-telephone set which is designed for an over-sea working range of 50 km (31 miles) between ship aerials 100 ft. high and having 200-ft. spans is being placed on the market by the Marconi Wireless Telegraph Company, Woolworth Building, New York.

The set comprises a transmitter and receiver, over-all dimensions 22 in. by 18 in. by 17 in. and weight 59 lb.; five cases of dry batteries, over-all dimensions of each case 21 in. by 18 in. by 5.5 in. and weight 70 lb.; one 6-volt, 80-amp-hour storage battery, weight 38 lb.; one switchboard, over-all dimensions 10 in. by 10 in. by 3 in. and weight 5.5 lb., and one receiving battery, over-all dimensions 9.5 in. by 17 in. by 5 in. and weight 20 lb. The set is also equipped with the following accessories and spare parts: two microphone cases and six spare microphone cells, six transmitting valves (double filaments), six receiving valves, one induction coil, one aerial tuning inductance, two pairs high-resistance telephones, one set of six crystals set in cups, connecting plugs and leads, six tuning lamps and small dry batteries for microphone and crystals.

The transmitter consists of a specially constructed valve shunted with condensers and induction coils in such a way that a continuous stream of oscillations is produced. The frequency of these oscillations is controlled by means of variable ebonite condensers. The oscillations are induced into the aerial wire through a

variable coupling, any tuning required being effected by means of the tuning lamp provided. A simple switch is used to change from talking to listening. This switch can be controlled from a distance in case the microphone is not near the set. A low-voltage current is used to heat the filaments of the valves, and for this purpose an 80-amp-hour accumulator is provided.

Electric Cuspidor Polisher

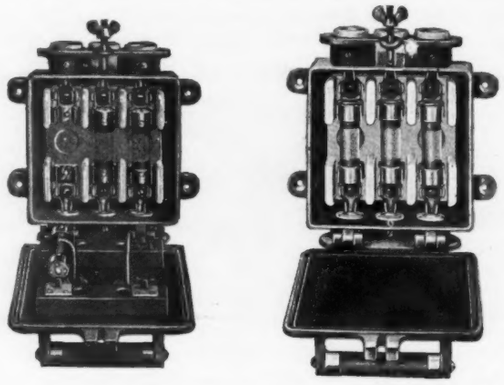
Apparatus for polishing cuspidors electrically is shown herewith. The cuspidor is held against a rotating disk, which is provided with an automatic centering device, by a plunger supported from an iron brace above. A block turning on ball bearings is attached to the end of the plunger. The disk is belt-driven by a 0.25-hp motor. The outfit is mounted on an oak truck equipped with rubber-tired casters. The same apparatus can also be used for buffing silverware or grinding cutlery; in either case a buffing wheel or a grinding disk forms an additional part of the equipment. When used as a grinder or a buffer the outfit is stood on end. This apparatus is being placed on the market by the J. I. Holcomb Manufacturing Company, Indianapolis, Ind., and the motor used in its operation is the product of the Robbins & Myers Company, Springfield, Ohio.

APPARATUS FOR POLISHING CUSPIDORS

Service Switch and Fuse Box

In Fig. 1 is shown a service switch designed for use both as a cut-out and as a switch. It consists of a set of inclosed fuses mounted in an iron box so that they can be made to swing with the cover and open the circuit or to remain in the fuse clips while the cover is drawn back, as desired. This service switch is so designed that it may be used on the outside of buildings where the wires enter or in cellars where the wires pass in from a subway, providing means whereby in cases of emergency the supply of energy may be cut off from the interior of the building and giving at the same time a main-line switch and cut-out so constructed that the circuit may be disconnected and the box sealed up. In the covers of the box are mounted fuse guides and withdrawal hooks. These hooks grasp the fuses when the levers outside the box are given a quarter turn.

In Fig. 2 is shown a fuse box which is similar to that of the service switch except that the cover is not provided with any mechanism for withdrawing the fuses from the circuit. Both boxes are equipped with rubber gaskets to make them waterproof.



FIGS. 1 AND 2—SERVICE SWITCH AND FUSE BOX

The service switch and fuse box described above are being manufactured by the D & W Fuse Company, Providence, R. I.

Multi-Point Switch for Electric Ranges

A new snap switch brought out by the Bryant Electric Company, of Bridgeport, Conn., for use with electric ranges and other heating appliances is arranged to be so connected that instead of increasing the number of coils or elements in circuit beginning with "low heat," as has been the general practice heretofore, the new arrangement gives the greatest heat in the first position of the switch. In other words, beginning with the switch in its "off" position, the first twist of the knob throws into circuit all the heating elements it controls. The second position cuts the heat down to medium, the third to low, and the fourth is the "off" position. In this way the degrees of heat are provided in the order in which they are most frequently desired, the heating device is more quickly brought to full operating temperature, and, since the current to be broken at any step is small, a very much smaller and more compact switch can be used. An indicating dial, showing the position of the switch, is set at an angle of 45 deg. so as to be visible from any position in front of or above the switch.

MULTI-POINT SNAP SWITCH FOR HEATING DEVICES

Jobber, Dealer and Contractor

STOCK-ACCOUNTING METHODS FOR JOBBERS

System of Cards and Tickets Used by New York City Firm Affords Daily Inventory of Stock on Hand

The Northwestern Electric Equipment Company, 30 East Forty-second Street, New York City, which conducts an exclusively wholesale business in electrical supplies, employs a very simple and effective method of stock accounting that furnishes a complete inventory at the end of each day. The company fills orders from its warehouse in Brooklyn. No retail stores are maintained and all accounting and other business operations are conducted at the main office in New York.

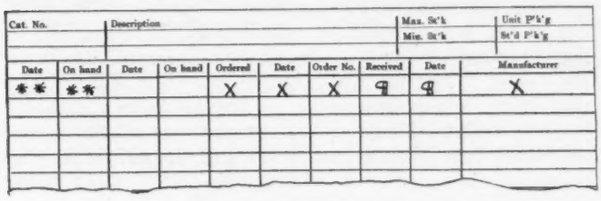


FIG. 1—WAREHOUSE STOCK-RECORD CARD

In general the stock-accounting system consists in keeping records of goods purchased, stock received, material on hand and quantity issued. In order to be able to obtain this information at any time there are employed two sets of cards and three forms of tickets.

Daily Inventory Card Files

One of the sets of cards is permanently kept in the office, being filed under the name of the material described thereon. When stock is received the office stock clerk adds to the amount already listed on the card, and when stock is issued he deducts from this amount, leaving a balance which shows the stock on hand. These cards therefore furnish a complete daily inventory of the stock by items.

The other set of cards is kept on file most of the time in the warehouse. When a certain line of goods becomes depleted, however, the stock card relating to that material is sent to the office, where the purchasing department fills in the spaces marked "X" as requisitions for new stock are made. The cards are then returned to the stock room where the stock clerk fills in spaces marked "¶" when the ordered goods are received. Spaces marked "* *" are filled in at the warehouse whenever the stock card is transferred to the main office, so that the stock may be checked from office records.

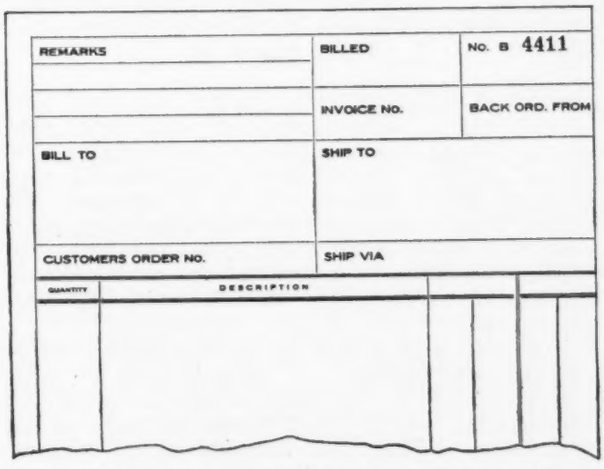


FIG. 2—TRUCK-DELIVERY OR BOY-DELIVERY ORDER FORM—OFFICE COPY

Purchasing Forms and Direct Delivery Tickets

Requisitions sent to manufacturers for supplying stock either to the warehouse or direct to the customers are made out in triplicate on order forms. The original, indicating the goods to be shipped, the method of transporting them, their destination and the identification mark to be stamped on the shipping case, is sent to the manufacturer. The duplicate copy is kept in an alphabetical file in the office for use in case the other becomes lost, and the third sheet is sent to the receiving department at the warehouse for checking the goods when they arrive. The latter copy, of course, is not sent to the receiving department if the goods are shipped directly to the customer, but is kept on file in the office.

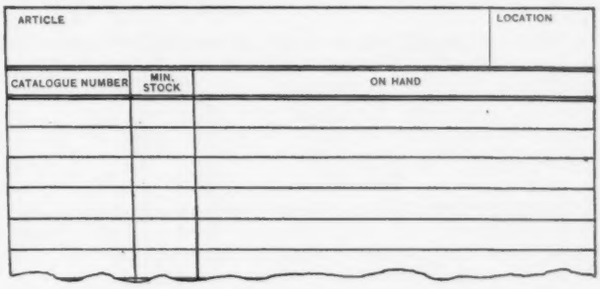


FIG. 3—OFFICE-RECORD CARD GIVING DAILY INVENTORY

When ordering shipments direct from the manufacturer to the customer the supply company sends a "Form D" ticket (meaning "direct delivery") along with the requisition, to be used as a packing slip. This ticket has about the same form as all of the others used as packing slips.

Checking Goods Received

As soon as a package is received at the stock room from a manufacturer the clerk looks on the case for the identification number and checks up the goods from the corresponding receiver's requisition copy, which is then stamped "Goods received" and signed. The receipt of the goods is then entered on the stock-room card and the receiver's copy of the requisition is sent to the office, where it is filed by order number until the manufacturer's bill is received. Upon receipt of the latter it is

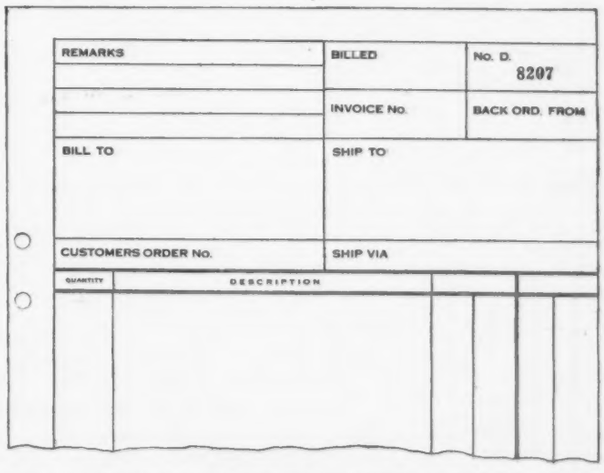


FIG. 4—PACKING TICKET FOR DIRECT SHIPMENT FROM MANUFACTURER TO CUSTOMER

checked with the receiver's ticket and attached thereto. The requisition voucher which has been filed under the manufacturer's name is then stamped "Bill received" as is also the receiver's ticket so that there is no possibility of losing the record that a bill has been re-

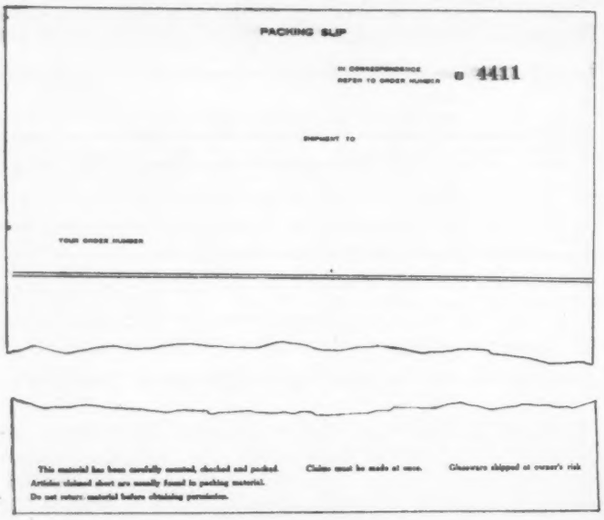

PACKING SLIP
IN CORRESPONDENCE REFER TO ORDER NUMBER
B 4411
SHIPMENT TO
YOUR ORDER NUMBER
This material has been carefully counted, checked and packed. Claims must be made at once. Glassware shipped at owner's risk
Articles claimed short are usually found in packing material.
Do not return material before obtaining permission.

FIG. 5—PACKING SLIP FOR TRUCK OR BOY DELIVERY

ceived. The auditing department after receiving a ticket and the attached bill, which has been checked by the purchasing department, forwards a check to the manufacturer for the amount indicated on the latter, and bills the customer by adding a profit to each item.

Delivery Forms

Orders which are filled from the warehouse are made on one of two forms of tickets, depending on the method of delivery. Orders on goods to be sent by express or freight are marked "E—F," and on those sent by boy or truck are marked "B."

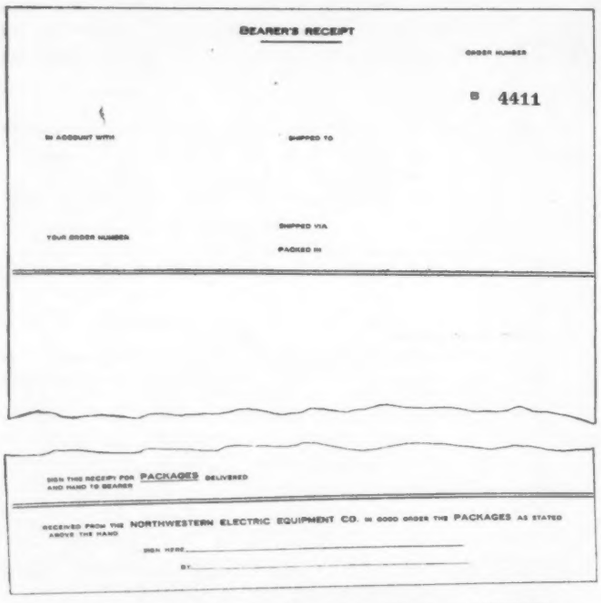

BEARER'S RECEIPT
ORDER NUMBER
B 4411
IN ACCOUNT WITH
SHIPPED TO
SHIPPED VIA
YOUR ORDER NUMBER
PACKED IN
SIGN THIS RECEIPT FOR PACKAGES DELIVERED AND HAND TO BEARER
RECEIVED FROM THE NORTHWESTERN ELECTRIC EQUIPMENT CO. IN GOOD ORDER THE PACKAGES AS STATED ABOVE THE HAND
SIGN HERE
BY

FIG. 6—BEARER'S RECEIPT FOR GOODS DELIVERED

"E—F" forms are made out in triplicate, the original and first copy being sent to the warehouse. Notations on the methods of shipment and other remarks are made on the original by the stock-room clerk, who returns it to the office files for billing purposes and reference. The first carbon copy is used as a packing slip and the other copy is kept by the auditing department for checking up the bills sent out each month. When an entire order cannot be delivered at one time a line is drawn through the missing items on the original form. These items are also stamped "Transferred to order No.——," while the corresponding items on the packing slip are stamped "Goods to follow," so that the customer will be informed of the shortage. The original "E—F" form is returned to the office, where a clerk fills out another "E—F" form for the material which is to be shipped later. In the space marked "Back order from" is marked the number of the original order. The number of the second order is stamped in the blank left on the original order following "Transferred to order No. ——." The same procedure is followed no matter how many separate shipments are made in filling the original order. The notation on any one of the orders therefore furnishes a clue to finding the original order as well as all of the subsequent tickets used in filling shortages.

"B" forms are made out in quadruplicate, with a similar provision for assembling tickets covering separate deliveries on the original order. All sheets except

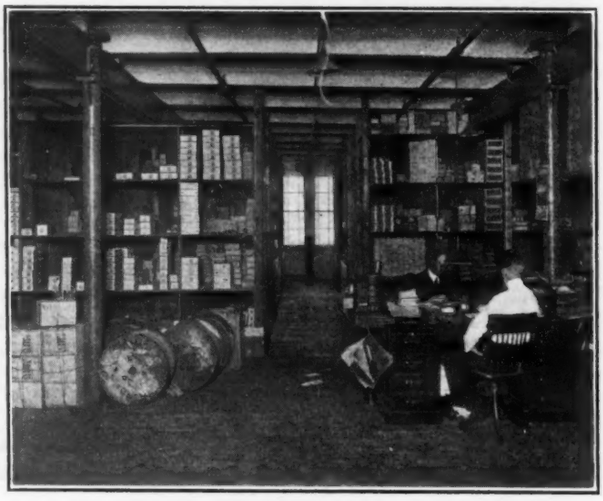


FIG. 7—SHELF STOCKROOM IN ELECTRICAL SUPPLY WAREHOUSE, BROOKLYN

one, which is the auditor's copy, are sent to the stock room initially. Notations are made on the original and on the packing slip as described in the foregoing under "E—F" orders. The original is then returned to the office for billing purposes and future reference. The second sheet, called the "bearer's receipt," is given to the person delivering the package, who obtains the consignee's signature on delivery of the goods. The receipted ticket is returned to the office and is kept in the proper files.

The audit copy is used by the clerk in checking up the stock-issuing cards. At the end of the month the copies are filed in alphabetical order and checked with the bills sent to customers to see that no order numbers are missing and to prevent the possibility of any goods being delivered without the consignee being billed therefor.

On the bottom of all packing tickets inclosed with goods sent out from the warehouse is printed, "This material has been carefully counted, checked and packed. Articles claimed short are usually found in the packing material. Do not return material before obtaining permission. Claims must be made at once. Glassware shipped at owner's risk."

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Employees' Quarter-Century Club.—A club has been organized by employees of the General Electric Company who have served the company for periods of twenty-five years or more. The branch at Schenectady, N. Y., has 150 members, and that at Lynn, Mass., close to 175.

Industrial Plants.—In the sixth edition of a book entitled "Work Done," published by Westinghouse, Church, Kerr & Company, New York, some typical examples of the company's operations in connection with industrial and power plants are described. The book is attractively illustrated and contains forty-eight pages.

Lighting Plant for Cuenca, Ecuador.—Mr. J. H. Torrens, an engineer for the General Electric Company, has sailed for Ecuador by way of Panama, leaving New York Aug. 28, to install a new electric-lighting plant at Cuenca, which is Ecuador's third largest city. Mr. Torrens expects to be absent in the southern hemisphere at least two years.

Pumps for City of Toronto.—A contract was awarded to the Turbine Equipment Company on Aug. 14 by the Toronto (Canada) Board of Control for two 24,000,000-gal. pumps for the main pumping station. The price of one of the units is $50,400 and of the other $48,400. These pumps are of the same design as one already installed.

American Embassies to Make Foreign Patent Payments.—Americans desiring to take out foreign patents at this time may make arrangements for payment through our embasssies abroad, according to an announcement by the Commissioner of Patents. Every possible effort is being made to protect American inventors from losses as a result of the war.

Electrical Equipment for Railways.—The Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., has received from the Third Avenue Railway, New York, an order for twenty-five control sets for its low-floor, 24-in.-wheel cars. The company has also received an order for 100 sets of control equipment for steel cars from the New York Municipal Railway Corporation.

Regulator Sales Territory Awarded.—The Corbett & DeCoursey Company, Columbia Bank Building, Pittsburgh, Pa., announces that it has closed a contract with the Thompson-MacArthur Regulator Company, of Buffalo, N. Y., for the exclusive sale of the Thompson automatic voltage regulator throughout Western Pennsylvania, Ohio, Indiana, Kentucky and West Virginia.

Convention of Electric-Sign Organization.—The fifth annual three-day convention of the executives and branch-office managers of the Federal Sign System (Electric), Chicago, was held at the Moraine Hotel, Highland Park, Ill., Aug. 5 to 7. With the exception of the San Francisco branch, each of the twenty-one branch offices of the organization was represented at the convention.

Automobile Lighting Company Unaffected by War Conditions.—Messrs. Gray & Davis, Inc., Boston, Mass., manufacturers of automobile lighting and starting outfits, are reported to be increasing their force and adding machinery to their plant, which is being kept in operation day and night. Up to the present it is said that the business of this concern has not suffered in any way on account of the European war.

Electric Pumping at San Diego.—The city of San Diego, Cal., has let contracts for two 250-hp motors for the operation of two four-stage centrifugal pumps which will pump water into the city reservoir. Electrical energy will be furnished by the San Diego Consolidated Gas & Electric Company. In addition, about ten 15-hp motors will be required to operate pumps which will lift the water from bored wells to the collecting reservoirs.

Central-Station Service for Tunnel Builders.—A contract has been closed between the New York Edison Company and the Flinn-O'Rourke Company, Inc., which is building new tunnels under the East River, for the supply of 10,000 hp of electrical energy for construction purposes. Two substations will be built at the Jeanette Park shaft, in which fourteen 600-hp motors will be installed.

Chemical Company's Business Good.—The Roessler & Hasslacher Chemical Company, 100 William Street, New York, is said to be faring well at present, and particularly is its business in acids and battery supplies for electrical companies excellent. The chemical company is expecting no dearth in the supply of raw material in the immediate future because of European unrest. The activities of this company are confined chiefly to the United States.

Gold-Mining Company Buys Electrical Energy.—A contract was closed recently by the Arkansas Valley Railway, Light & Power Company, Pueblo, Col., with the Vindicator Consolidated Gold Mining Company, covering 285 hp in motors for the operation of an air compressor. The contract runs for a five-year period and the compressor will be operated sixteen hours a day. The estimated gross revenue from this installation for the period of the contract is $60,000.

Pryor Ice & Light Company's Property to Be Sold by Receiver.—Mr. John R. Cullinane, 903 LaSalle Building, St. Louis, announces that the plant and property of the Pryor (Okla.) Ice & Light Company will be sold at Pryor at 2 p. m. on Sept. 12. Mr. Cullinane, as receiver for the company, has issued a printed report of its business for the year ended Aug. 1, 1914, which shows gross income of $12,725 and expenses of $10,577, leaving a balance of $2,148. The company has a franchise until 1927 and has a street-lighting contract of ten arc lamps.

Show-Counter Display Card.—The Economical Lamp Division, National Lamp Works of the General Electric Company, 25 West Broadway, New York, is sending out an attractive display card advertising its so-called "hylo" turn-down lamps. The card is printed in four different colors. Fac-similes of cartons in which the tungsten lamps are packed are shown on one side of the card, and of the carbon lamps on the other. These turn-down lamps are equipped with two filaments. The tungsten lamps take 25 watts "high" and 5 watts "low" or 40 watts "high" and 5 watts "low."

Paint Prices Soaring.—A general rise in the prices of paints is noted as a result of the war in Europe. Although its business in paints and varnishes for electrical purposes has recently been very good, the National Paint Company, 100 William Street, New York, is reported to expect a lull in the near future. This condition of the trade will result on account of the scarcity of raw materials coming into this country from foreign lands. The business of the foreign companies affiliated with the National Paint Company in London, Petrograd and Hamburg is reported to be practically at a standstill.

Bolivia's Supply of Tungsten.—According to Mr. Frank G. Carpenter, the well-known newspaper correspondent, Bolivia will make a wonderful mineral exhibit at the Panama-Pacific Exposition of next year. One metal that will be shown in great variety, it is declared, is tungsten, which has become so important in incandescent electric lighting. This metal comes from the department of Potosi, which is said to supply the greater portion of the world's consumption. Mr. Carpenter says that the owners of these mines are known as the tungsten kings, and that they control the world's output and fix the prices.

American Fuses and Wiring Specialties for South America.—The Chicago Fuse Manufacturing Company does some export business—comparatively small, however, compared to the volume of domestic business. It sends some of its products to South America, particularly to Argentina. Mr. W. W. Merrill, vice-president of the company, in answer to a question from a representative of the *Electrical World*, said that this business has shown some increase in volume of late. It is handled through the New York office of the company. The company has found the Germans its principal competitors in South American countries.

Because of War Turbine Company Expects Increased Business.—The Kerr Turbine Company, Wellsville, N. Y., has recently been selling a number of turbines to sugar concerns in Cuba, Ecuador and our own Southern States. On account of the war in Europe and the crippling of the sugar-beet industry in that region as a result, a great demand for sugar at maximum prices is expected. Accordingly the sugar-cane interests in both North America and South America will tend to increase their manufacturing facilities. The business of the Kerr company for the past month is said to have been the best the company has ever had. Most of the recent orders for turbines have been coming from the Middle West.

Orders for Gas Engines.—Among recent orders received by the Bruce-Macbeth Engine Company, Cleveland, Ohio, for its multi-cylinder gas engines are the following: Ambridge Water Works, Ambridge, Pa., one 125-hp four-cylinder natural-gas engine; Swarthmore College, Swarthmore, Pa., one 40-hp twin-cylinder artificial-gas engine; Magnolia Petroleum Company, Hodge, Tex., two 150-hp four-cylinder natural-gas engines; Washington University, St. Louis, Mo., one 40-hp artificial-gas engine; Wm. Chisholm & Sons Company, Cleveland, Ohio, one 150-hp natural-gas engine; Jeannette Glass Company, Jeannette, Pa., one 125-hp natural-gas engine; Ohio State Reformatory, Mansfield, Ohio, one 40-hp natural-gas engine; C. F. Jackson Company, Findlay, Ohio, one 90-hp natural-gas engine; Northside Cameraphone Theater, Pittsburgh, Pa., two 70-hp natural-gas engines.

Activity in the Rubber Industry in Mexico.—Practically all of the guayule rubber factories in Mexico, it is reported, have resumed operations. Preparations are being made by the Intercontinental Rubber Company to run all its factories, including its large plant at Torreon, on full time. Workmen have also started to cut the guayule shrub on the company's 2,000,000-acre property in the State of Zacatecas. Now that the constitutionalists have cleared Northern Mexico of disturbances, members of the Madero family have returned to their homes and will soon have their guayule manufacturing interests going again. So far as can be learned, none of the five rubber-manufacturing plants owned by the Maderos was destroyed by the warring factions, and all the factories need before resuming operations will be an overhauling. Next to the Intercontinental company, the Maderos are said to be the largest owners of guayule properties in Mexico.

NEW YORK METAL MARKET PRICES

	Aug. 25 Bid	Aug. 25 Asked	Sept. 1 Bid	Sept. 1 Asked
Copper				
Standard spot*				
	Selling Prices £ s d		Selling Prices £ s d	
London, standard spot*				
Prime Lake	12.50 to 12.75†		12.50 to 12.75†	
Electrolytic	12.25 to 12.37½†		12.25 to 12.35†	
Casting	12.15 to 12.25†		12.15 to 12.25†	
Copper wire base	13.75 to 14.00		13.75 to 14.00	
Lead	3.90		3.90	
Nickel	40.00 to 45.00		40.00 to 45.00	
Sheet zinc, f.o.b. smelter	7.50 to 8.00		8.50	
Spelter, spot	6.10 to 6.20		6.00 to 6.10	
Aluminum	20.00 to 21.00		19.50 to 20.50	

***COPPER EXPORTS**

Total tons to Sept. 1 19,676

*From daily transactions on the New York Metal Exchange.
†Nominal.
Note.—The New York Metal Exchange and the London Metal Exchange have been closed until further notice. No reliable quotations on old metals can be obtained for the present. There is no buying in this market.

Corporate and Financial

Iowa Company Retires Bonds.—The Sioux City Service Company has retired $40,000 first and refunding mortgage 5 per cent bonds through the operation of the company's sinking fund.

New Company's First Dividend.—The Wisconsin-Minnesota Light & Power Company has declared an initial quarterly dividend of 1¾ per cent on the $1,700,000 of 7 per cent cumulative preferred stock. The dividend is payable on Sept. 1.

Harwood Electric Company Defers Dividend.—The Harwood Electric Company of Hazleton, Pa., has deferred payment of the semi-annual dividend on the 6 per cent cumulative preferred stock. A letter to the stockholders says that the action was taken on account of the general financial situation.

Receiver Appointed for Kansas Company.—Judge McPherson on Aug. 20 appointed Mr. L. G. Treleaven receiver of the Consumers' Light, Heat & Power Company of Topeka, Kan. Mr. Treleaven has for years been manager of the company. The action grew out of the suit brought by the Central Trust Company of New York as trustee to foreclose the mortgage for $1,000,000, the January, 1914, and July, 1914, coupons being in default.

Cities Service Financial Statements.—Price, Waterhouse & Company, New York, have made an examination of the books of the Cities Service Company, of New York, from its organization up to and including April 30, 1914, besides making an examination of a substantial portion of the subsidiary companies for the twelve months ended April 30, 1914, the gross earnings of which aggregated about 60 per cent of the total gross earnings. The income account for the year ended April 30, 1914, is as follows: Company's proportion of earnings applicable to common stock of subsidiary companies, $2,836.932; dividends on preferred stock of subsidiary companies, $21,221; interest on bonds of subsidiary companies, $176,607; interest on bills and accounts receivable, $293.772, totaling $3.328,532. This, less general and administrative expenses, $65,879; interest on bills and accounts payable, $97,598; interest on five-year 7 per cent convertible gold notes, $246,685; interest on Consolidated Cities Light, Power & Traction Company 5 per cent bonds, $175,000, or a total of $585.162, left for profits $2,743,370. Deducting preferred-stock dividends of $1,202,242 and common-stock dividends of $646,329 left a balance transferred to surplus of $894,799. The company has also issued an earnings statement for the year ended July 31, in which gross earnings are given as $3,543,737 and expenses as $97,269, leaving $3,446.468 as net earnings. Interest on notes amounted to $320,991, dividends on preferred stock amounted to $1.422.125, and dividends on common stock amounted to $702,686, thus leaving $1.000.666 as net to surplus. A surplus reserve of $22,184 added to the surplus of $2,733,534 made the total surplus $2,755,718. The item "surplus reserve" is new, being in accordance with an order of the board of directors to set aside, starting July 1, 1914, as a reserve fund an amount equal to 10 per cent of the net earnings of the company available to stock, which is to be in lieu of a depreciation fund. This fund is in addition to the usual maintenance charges, which are regularly included in the operating expenses of the company. At a meeting Aug. 26 it was decided that present conditions and outlook do not warrant any immediate action beyond that previously taken with respect to the payment of dividends. Mr. Henry L. Doherty, president of the company, has written the following to the stockholders in regard to the war situation: "Since our last communication various shareholders have written to inquire how the war in Europe can affect the payment of dividends by this company. Public utility properties are required continually to extend their service to meet the natural, growing demands of their communities. Capital for these requirements is provided ordinarily from the surplus earnings and by the sale of new securities. Under existing conditions, when all security markets are closed, the Cities Service Company must be prepared to meet all capital requirements out of the income from its properties. Your directors believe that the measures put into effect strengthen the position of the company and fortify the investment of the stockholders."

LARGE GAINS IN MIDDLE WEST

Returns Received from Two-Thirds of Central-Station Industry of Central States Show Increases Despite Business Depression

The returns as received by the *Electrical World* for the June operations of the central-station companies operating in the Central States show for the most part the same healthy state of business that was shown for May. The increase of June, 1914, over June, 1913, was practically the same as that of May, 1914, over May, 1913. Illinois has been left out of the tables owing to incomplete returns.

TABLE I—COMPARATIVE FIGURES FOR JUNE OPERATIONS OF 72 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE EAST NORTH CENTRAL STATES OF OHIO, MICHIGAN, INDIANA AND WISCONSIN (ILLINOIS EXCLUDED) FOR THE MONTHS OF MAY AND JUNE, 1913 AND 1914

	Income Derived from Sale of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May.....	$1,969,150	$1,789,083	10.0	97,914,432	90,161,505	8.5
June.....	1,845,309	1,664,730	11.0	94,194,607	85,902,045	9.5

The returns which have been received so far from Illinois represent but a small portion of the total industry in that State. However, the returns that did come in showed an increase in income, with one exception, of from 12 per cent to over 30 per cent. The one exception showed a decrease in income of 4 per cent but an increase in output of 4 per cent. It was, however, a small company — its monthly income from the sale of electrical energy being less than $10,000. One company, the

TABLE II—COMPARATIVE FIGURES FOR MAY AND JUNE, 1913 AND 1914, SHOWING THE OPERATIONS OF 90 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE WEST NORTH CENTRAL STATES

	Income Derived from Sale of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May.....	$778,029	$633,432	23.0	76,302,296	55,015,511	38.7
June.....	754,935	610,224	23.6	71,864,644	53,909,090	33.3

largest from which we received returns, a company with a monthly income around the hundred-thousand-dollar mark, showed an increase for June of over $13,000.

Northeast Growth from 2 to 20 per Cent

Comparative figures have been received from 72 per cent of the industry in the rest of the East North Central States,

TABLE III—JUNE OPERATIONS OF CENTRAL-STATION COMPANIES REPRESENTING 36 PER CENT OF THE INDUSTRY IN THE EAST SOUTH CENTRAL STATES

Income Derived from Sale of Energy			Energy Output in Kw-hr.		
June, 1914	June, 1913	Per Cent Increase	June, 1914	June, 1913	Per Cent Increase
$246,876	$235,469	5.0	10,893,631	10,191,363	7.0

namely, Ohio, Michigan, Indiana and Wisconsin. These companies, it will be noticed in Table I, show an exceedingly satisfactory growth both in income and output. The income increase in both May and June, 1914, show an increase of approximately $160,000 over the corresponding periods in 1913. Also the output for the same periods has increased in the neighborhood of 8,000,000 kw-hr. These returns cover the industrial section of the Central States. With the June promises of an exceedingly good harvest industry in this group was bound to advance. The large cities, without one exception, showed increases. The smallest increase was an increase of $350, or 2 per cent, coming from a small company in a large city. The largest increase was $53,000, or 13.5 per cent. Other companies showed still greater percentage growth, although not as large in bulk. One company with a monthly income from the sale of energy in the neighborhood of $25,000 showed an increase of approximately 20 per cent.

Northwestern Group Encouraging

The *Electrical World* has collected returns for May and June from practically the entire central-station industry of the West North Central States. It is interesting to note

TABLE IV—JUNE OPERATIONS OF CENTRAL-STATION COMPANIES REPRESENTING 66 PER CENT OF THE INDUSTRY IN THE WEST SOUTH CENTRAL STATES

Income Derived from Sale of Energy			Energy Output in Kw-hr.		
June, 1914	June, 1913	Per Cent Increase	June, 1914	June, 1913	Per Cent Increase
$574,410	$499,007	13.0	19,843,957	14,246,882	39.3

that here, as in the East North Central States, the increase is approximately the same, namely, $145,000 income and 20,000,000 kw-hr. The percentage, however, in the Northwestern group is more than double that in the Northeastern group. With a combined population for its seven states less than the four states above included in the Northeastern group, the Northwestern group represents a region in which it is much more difficult to get business. That it should be growing at the rate of approximately 25 per cent a month in the month having the lightest load of the year is indeed encouraging.

South Central States' Returns

In the East South Central States only 36 per cent of the industry is reporting, and while the returns now received do not show a large percentage or bulk increase, it is not to be taken as true for the whole region. It may easily be that the remaining 64 per cent would materially raise the percentage increases given in Table III. From the West South Central States two-thirds of the industry sent in figures for June. These companies show an enormous gain in output and a satisfactory gain in income.

Contributory Conditions

With the exception of Illinois, as has before been noted, the *Electrical World* received returns from 56 per cent of the industry for May and 67 per cent for June. Large percentage increases are to be expected in the Middle West.

TABLE V—RETURNS FOR MAY AND JUNE OPERATIONS FROM CENTRAL-STATION COMPANIES IN THE CENTRAL STATES (EXCLUDING ILLINOIS)

	Income Derived from Sale of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May (56 per cent of industry).....	$3,200,553	$2,841,685	12.7	202,611,026	162,363,929	24.8
June (66.7 per cent of industry).....	3,914,836	3,459,497	13.2	217,920,183	182,406,207	19.4

It is not an old-established industrial territory like the Middle Atlantic States but a new territory devoted largely to agriculture. The market and industry are both young, and therefore rapid growth must be expected until the time shall come when the market is saturated. It will be noticed from the tables that the states showing the greatest percentage increase are the West North Central States. The

companies in those states in the past year have come to recognize the value of up-to-date, wide-awake salesmen. This is particularly true of the larger cities in this group. Some show increases as high as 20 per cent, and many of them show increases of over 15 per cent. The mining industry is continually ordering more electrical machinery. The large harvest has bettered financial conditions and made for a greater number of industrial sales. All of the larger central-station companies are weekly reporting large contracts signed for motor load.

Business Notes

The Poole Engineering Company, Baltimore, Md., was recently reorganized and Mr. S. P. Brady appointed president.

The Raymond Electric & Manufacturing Company, of Detroit, Mich., has purchased the entire stock of the former Seidler Miner Electric Company, of Detroit.

Main Electric Manufacturing Company, 219 South Beatty Street, Pittsburgh, Pa., announces that it has opened a branch sales office in Delaware, Ohio, with Carl J. Main as manager.

The Crown Woven Wire Company.—The factory of the Crown Woven Wire Company has been moved to 201 Fulton Street, New York. This company's plant was recently destroyed in the Salem (Mass.) fire.

Greenwood Advertising Company, manufacturer of electric signs, Knoxville, Tenn., announces that it has opened an Eastern office at 510 Sansom Street, Philadelphia, Pa., under the management of F. J. McCormick.

The Trenaman Electrical Dental Manufacturing Company, 107 West Twenty-fifth Street, New York, has been formed. Its officers are as follows: President, John V. Trenaman; treasurer, T. F. Diack, and secretary, J. P. Page.

The Goulds Manufacturing Company.—A. H. Whiteside, formerly connected with the Sterling Boiler Company, the Westinghouse Electric & Manufacturing Company and the Allis-Chalmers Company, has been appointed vice-president and general sales manager of the Goulds Manufacturing Company, Seneca Falls, N. Y. Mr. Whiteside succeeds Mr. W. E. Davis.

Elliott and Liberty Companies' Chicago Sales Agency.—Charles C. Hughes has been appointed district sales manager for the Elliott Company and the Liberty Manufacturing Company in Chicago, with headquarters at 527 Monadnock Building. He succeeds S. A. Bockius, who recently resigned to enter business for himself as manufacturers' agent, in Pittsburgh.

New Industrial Companies

The Woolley-James Electric Company, of Buffalo, N. Y., has been chartered with a capital stock of $50,000 by J. Hora, Jr.; W. S. James, and L. A. Woolley. The company purposes to act as a commission concern and deal in electrical appliances.

The Andes Exploration Company, of New York, N. Y., has been incorporated with a capital stock of $100,000 by K. A. Siemers, M. McCune and R. Kay, 608 West 113th Street, New York, N. Y. The company intends to do a mining, lumbering and electric construction business.

The Goshen Stamping & Brass Company, of Goshen, Ind., has been formed to manufacture electric fixtures and to do a contracting business. Its activities will be mostly confined for the present to southern Michigan and northern Indiana. The officers are Messrs. A. F. Ernest, president; A. H. Schmidt, vice-president, and C. B. Miller, secretary.

The Minton Safety Equipment Company, of New York, N. Y., has been incorporated by Grace M. Minton, of Metuchen, N. J.; Charles W. Abrams, 450 Riverside Drive, New York, N. Y., and James D. Abrams, 426 Third Avenue, Lyndhurst, N. J. The company is capitalized at $10,000 and purposes to manufacture and deal in safety devices for elevators, etc.

Trade Publications

Rubber-Covered Wires.—A price list of rubber-covered wire is given in a leaflet published by M. B. Austin & Company, Chicago, Ill.

Tube Cleaners.—Cleaners for boiler tubes are listed and illustrated in Bulletin No. 40 issued by the Roto Company, Hartford, Conn.

High-Sensitivity Galvanometer.—Bulletin No. 228 issued by the Leeds & Northrup Company, Philadelphia, describes a D'Arsonval galvanometer of high sensitivity.

Mesco Products.—The Manhattan Electrical Supply Company, 17 Park Place, New York City, has issued a catalog covering all of the products which it manufactures.

Semi-Fluid Lubricant.—Lesoyl, a semi-fluid lubricant made by the Lumen Bearing Company, Buffalo, N. Y., is described in a booklet prepared by that organization.

Push-Button Switch.—In a leaflet issued by the Bryant Electric Company, Bridgeport, Conn., is described a push-button switch equipped with a molded-insulation cover.

Electric Elevators.—In a catalog issued by the American Machine Company, Louisville, Ky., various types of electric elevators manufactured by the company are listed and illustrated.

Service Switches and Fuse Boxes.—Circular No. 112 issued by the D & W Fuse Company, Providence, R. I., is descriptive of service switches and fuse boxes for National Code fuses.

Fuses and Cut-Outs.—In Catalog No. 15 published by the D & W Fuse Company, Providence, R. I., a complete list of cartridge fuses and cut-outs manufactured by the company is given.

Lockfast Plugs.—A plug which may be inserted or removed from a socket by making a single turn is described in a folder issued by the Yost Electric Manufacturing Company, Toledo, Ohio.

Electric Apparatus.—Bulletins issued in July by the Cutler-Hammer Manufacturing Company, Milwaukee, describing various types of electrical apparatus, are being sent out under one cover.

Cement Paint.—The uses to which flake-white cement paint were put in the Barclay Building, Newark, N. J., are described in a circular issued by William J. Niles, Trenton Avenue, Philadelphia, Pa.

Water Strainers.—The Lagonda Manufacturing Company, Springfield, Ohio, has published a twenty-page catalog describing multiple water strainers for power plants and pumping-station intake lines.

Wooden Poles.—Methods of felling and preparing poles for telephone, telegraph and transmission-line purpose are given in an attractive booklet recently published by the Western Electric Company, New York.

Fixtures for Gas-Filled Tungsten Lamps.—The Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, Ill., is distributing a bulletin describing its fixtures for gas-filled tungsten lamps.

Motion-Picture Apparatus.—In an atractively illustrated twenty-eight-page catalog issued by the Precision Machine Company, Inc., 317 East Thirty-fourth Street, New York, are described a so-called "simplex" projector and accessories.

Alarm for Escaping Gas.—In a catalog issued by the Gas Safety Electric Bell Company, Inc., 209 East Nineteenth Street, New York, which is printed in English and Italian, an apparatus for detecting escaping gas is described.

Flame-Arc Versus Nitrogen-Filled Lamps.—The Koerting & Mathieson Company, 49 East Twenty-first Street, New York City, has issued a folder comparing the costs of operating its Excello flame-arc lamps and nitrogen-filled incandescent lamps.

Triangular Choke Coil.—A horn-gap lightning arrester consisting of a triangular-shaped choke-coil and cartridge-type resistors mounted as a unit on insulators is described in a circular issued by the Railway & Industrial Engineering Company, Greensburg, Pa.

Personal Mention

Mr. J. E. Carroll has been appointed manager of the Mauston (Wis.) Electric Service Company.

Mr. Lester E. Flint has succeeded Mr. Henry S. Thompson as treasurer of the Turner Falls (Mass.) Company.

Mr. Harry R. Margetts has been appointed general superintendent of the municipal electric plant at Murray, Utah.

Mr. E. F. Williams has succeeded Mr. P. R. Horry as manager of the Home Electric Company, Guttenberg, Ia.

Mr. H. W. Brubaker has been appointed electrical superintendent of the Edison Electric Company, Lancaster, Pa.

Mr. C. A. Reese has succeeded Mr. C. S. Newman as superintendent of the municipal electric plant at Easton, Pa.

Mr. L. L. Gillett has been made general superintendent of the George Warren Company's electric plant at Muscoda, Wis.

Mr. George R. Sheldon has superseded Mr. Robert Sealy as treasurer of the Wisconsin Edison Company, Milwaukee, Wis.

Mr. P. F. Forsythe has succeeded Mr. M. L. Morrison as superintendent of the municipal electric plant at Holton, Kan.

Mr. W. T. Tucker has been appointed manager of the Mineral Wells (Tex.) Electric System, succeeding Mr. L. M. Levinson.

Mr. Francis Varga has succeeded Mr. G. A. Havens as vice-president and secretary of the Leon (Ia.) Electric Company.

Mr. William Summers has succeeded Mr. C. C. Baltzly as chief engineer of the Sioux Falls (S. D.) Light & Power Company.

Mr. D. W. Blakeslee has been appointed instructor in electrical engineering at the University of Arkansas, Fayetteville, Ark.

Mr. J. W. Cooper has become manager of the Sabinal (Tex.) Water & Ice Company as successor to Mr. C. M. Neatherlin.

Mr. E. J. Baum has succeeded Mr. H. J. Ward as local manager of the American Light & Power Company, St. Charles, Mo.

Mr. Edgar Z. Wallower, for the last six years superintendent of the Harrisburg (Pa.) Light & Power Company, has been appointed general manager of the Lockport (N. Y.) Light, Heat & Power Company.

Mr. J. S. Dales has been appointed vice-president of the Interstate Public Service Company and the Franklin (Ind.) Water, Light & Power Company, both of which belong to the Middle West Utilities Company.

Mr. C. M. Kaltwasser, formerly manager of the Lockport (N. Y.) Light, Heat & Power Company, became general manager of the Harrisburg (Pa.) Light & Power Company Sept. 1. As noted above in our columns, Mr. Kaltwasser will be succeeded at Lockport by Mr. Edgar Z. Wallower, formerly operating superintendent at Harrisburg.

Mr. J. A. Trawick has resigned as manager of the Mississippi River Power Company, which operates the great water-power plant at Keokuk, Ia., to become vice-president and general manager of the United Electric Securities Company, of Boston. Mr. Trawick some years ago managed utility properties for the corporation to which he is returning. He came to Keokuk in May, 1911, from Tampa, Fla., where he was manager of the Stone & Webster utility interests.

Mr. James N. Hatch, for eleven years connected with the firm of Sargent & Lundy, engineers, Chicago, has resigned to open an office at 1525 Old Colony Building, Chicago, as a consulting engineer. At first Mr. Hatch will devote particular attention to appraisal and valuation work. He is at present associated with Prof. M. E. Cooley in the appraisal of the properties of the Detroit United Railway Company. Mr. Hatch is a graduate of the University of Michigan and holds the degrees of C. E. and M. E. from that institution. He is a member of the American Society of Civil Engineers, the Western Society of Engineers and the Engineers' Club of Chicago.

Mr. Parker H. Kemble has resigned as manager of the electrical commercial department of the Union Gas & Electric Company, Cincinnati, Ohio, on account of ill health. To secure a complete rest he has planned to take his family for a trip down the Ohio and Mississippi Rivers on a motor-driven houseboat. Mr. Kemble's career is interesting because of his wide experience and training. He was educated at Harvard, at the Technology School in Dresden, Germany, and at the Massachusetts Institute of Technology. Following this theoretical training he received practical experience in marine and mechanical engineering at the shipyards of William Cramp & Sons, Philadelphia. Later he joined the engineering staff of the Boston Elevated Railways Company. When the Windsor Locks Electric Lighting Company, the Enfield Electric Light & Power Company and the Enfield Gas Company were consolidated into the Northern Connecticut Light & Power Company, of Windsor Locks, Conn., Mr. Kemble was engaged to rebuild and operate the combined system. Leaving this company, he went to Brooklyn, N. Y., to become district manager for the Edison Electric Illuminating Company there. Prior to his connection with the company which he has just left he was general sales manager of the Toronto (Ont.) Electric Light Company. Mr. Kemble is a member of numerous engineering societies and served as vice-president of the Canadian Electrical Association in 1912.

Mr. Truman P. Gaylord, whose appointment to be acting vice-president of the Westinghouse Electric & Manufacturing Company was announced in the *Electrical World* of Aug. 29, is the district manager of the Chicago office of the same company. Mr. Gaylord will succeed Mr. H. D. Shute, who has been appointed treasurer of the company. He will remove his office to East Pittsburgh on Sept. 21. Mr. Gaylord, who is a native of Shelby, Mich., is a trained electrical engineer. He was a member of the class of '93 of the University of Michigan, where he took the electrical engineering course. He spent three years at that institution, but did not graduate there, going in 1892 to the electrical department of the World's Columbian Exposition at Chicago, where he was made engineer of underground construction. Here the young student carried to a successful completion a work that abounded with perplexities and difficulties. At the conclusion of the World's Fair in 1893 Mr. Gaylord entered Armour Institute in Chicago and graduated, receiving the degree of B. S. in E. E. Later he received the full E. E. degree. For several years Mr. Gaylord was associate professor of electrical engineering at Armour, resigning in 1898 to take a position in the testing laboratory of the Chicago Edison Company. A year later, in 1899, Mr. Gaylord entered the Chicago office of the Westinghouse Electric & Manufacturing Company, with which he has been connected ever since. At first a sales engineer and salesman, his promotion was rapid, for, in 1903, he was made manager of the office. During Mr. Gaylord's administration of the Chicago office its business has increased in a very marked degree. The new vice-president is a man with unusual gifts as an executive and one who is universally respected for his ability and high personal character. He is an associate of the American Institute of Electrical Engineers, a member of the Jovian Order, the Electric Club of Chicago and the Union League Club of Chicago. He is married and has one child.

T. P. GAYLORD

Obituary

Henry Harbinson Sinclair, pioneer in electric transmission and hydroelectric development in California and vice-president of the Southern California Edison Company, Los Angeles, Cal., died at his home in Pasadena, Cal., Aug. 31, at the age of fifty-seven years.

Construction

New England

AUGUSTA, MAINE.—The Edwards Mfg. Co., it is understood, is contemplating the installation of a hydroelectric power plant next spring to supply electricity to operate its cotton-manufacturing plant at the west end of the Kennebuc dam. The proposed station will be erected just north of the present No. 4 station and will be equipped to develop about 1800 hp.

MOUNT VERNON, MAINE.—The local electric-light plant, owned by R. H. Jacobs, was recently destroyed by fire, causing a loss of about $10,000.

PRINCETON, MAINE.—The local electric-lighting plant has been removed to the steam mill of C. F. Eaton for the present.

WATERVILLE, MAINE.—The Central Maine Pwr. Co., of Waterville, expects to build a new fireproof power station to replace the one injured by fire. This will contain only a small amount of electrical apparatus. The larger part of it will be used as a substation to distribute electricity for the Waterville district and the Waterville, Fairfield & Oakland Railway system. The number of panels for the distribution system has not yet been determined. F. H. Mason is chief engineer.

WINTHROP, MAINE.—The Winthrop & Wayne Lt. & Pwr. Co. has contracted with the Central Maine Pwr. Co., Augusta, to furnish electricity to operate its system in both Winthrop and Wayne. The high-tension (33,000 volts) transmission line will be tapped on the Whitten Road. The line to Winthrop will be about 10 miles in length.

BOSTON, MASS.—Plans have been announced by Fred S. Gore, commissioner of the Penal Institutions Department, for improvements at Deer Island, which contemplate the construction of a central power station to be connected with the main building by a series of tunnels.

SOUTH HADLEY FALLS, MASS.—A commission, consisting of Senator Calvin Coolidge, of Northampton; Chester Main, of Winchester, and W. S. Robinson, of Springfield, has been appointed to appraise the plant of the South Hadley El. Co. The property is to be purchased by the town and operated as a municipal lighting plant

TAUNTON, MASS.—The State Gas and Electric Light Commission has authorized the transmission lines of the Taunton municipal electric-light plant to be extended to Raynham.

WATERTOWN, MASS.—Preparations are being made to install an ornamental street-lighting system on Galen Street between Watertown Square and the Newton line. Mazda lamps of 80 cp will be used.

WEYMOUTH, MASS.—Work has started on the construction of the new power house of the Weymouth Lt. & Pwr. Co. on Jackson Square.

PAWTUCKET, R. I.—Preparations are being made by the Broad Street Pwr. Co. for the erection of a new building (226 ft. by 65 ft.) at the corner of Broad Street and Railroad Avenue, to cost approximately $125,000.

Middle Atlantic

EAST ROCKAWAY, N. Y.—Plans are being considered for lighting the streets of the village by electricity.

ITHACA, N. Y.—Bids will be received by E. L. Williams, Cornell University, Ithaca, until Sept. 28 for construction, including heating, plumbing and electric work, of the Drill Hall, Cornell University. Separate bids must be submitted on each division of the work; no combination of bids will be considered. Drawings and specifications may be consulted and blank forms of proposals obtained at the office of the treasurer of Cornell University, at the Department of Architecture, Capitol, Albany, and at the New York office of the Department of Architecture, Woolworth Building, New York. Copies of plans may be obtained at the Department of Architecture, Albany, upon deposit of $15 for construction work and $10 for each set of heating, plumbing and electric plans. Lewis F. Pilcher, Capitol, Albany, is state architect.

JAMESTOWN, N. Y.—The Western New York El. Co., of Jamestown, N. Y., is erecting a three-phase, 25-cycle, 2300-volt (aluminum wire) transmission line on the poles of the Jamestown, Westfield & Northwestern R. R. Co., which follows the east side of Chautauqua Lake. This line will be 20 miles long and will supply electricity for lamps and motors in the towns of Fluvanna, Greenhurst, Maple Springs, Dewittville, Point Chautauqua and Hartfield, the village of Bemus Point, and other places along the line. F. W. Bullock is superintendent.

LILLY DALE, N. Y.—The local electric-light plant was damaged by lightning recently. The generator was wrecked and the town is at present without electrical service.

MINETTO, N. Y.—The Minetto-Meridan Shade Cloth Co. has started work on construction of a power house at the Minetto dam to develop about 10,000 hp. The company, it is understood, will utilize about 2,000 hp.

NEW YORK, N. Y.—The Flinn-O'Rourke Co., which has the contract for building the new subway tunnels under the East River, has entered into a contract with the New York Edison Co. to furnish 10,000 hp of electrical energy for operation of tunneling equipment. Two power plants are now in course of erection in which 14 motors of 600 hp each will be installed.

NEW YORK, N. Y.—Bids will be received by the Board of Health of the Department of Health, corner of Centre and Walker Streets, New York, until Sept. 15 for furnishing labor and material required to install and complete, together with all necessary alterations, the electric work in a pavilion on the grounds of the Department of Health, Flushing Avenue, near Jamaica. Blank forms and further information may be obtained at the office of the chief clerk of the department.

OVID, N. Y.—The water-power plant of the Ovid El. Co. at Taughannock Falls was recently destroyed by fire. The plant, it is understood, will be rebuilt at once. The company furnishes electrical service in Ovid, Trumansburg and Interlaken.

AUBURN, PA.—The Auburn El. Lt., Ht. & Pwr. Co. has taken over the West Township and the Port Clinton El. Lt., Ht. & Pwr. companies and consolidated them with the Auburn company. D. W. Nagle is secretary and treasurer.

HARRISBURG, PA.—Applications have been made to the State Department by H. L. Mitchell, L. C. Lamb and R. M. Evans, of Pittsburgh, for charters for the following companies: the Forward Township El. Co., the Penn Township El. Co., the Adams Township El. Co. and the Cranberry Township El. Co. The companies will supply electricity for lamps, heaters and motors in the townships for which they are named.

HAZLETON, PA.—The Harwood El. Co., of Hazleton, is extending its transmission lines from Danville to Sunbury. These lines will probably be completed about Oct. 1. A second line is being erected from Berwick to Danville to provide for the increasing demand in that district.

JOHNSTOWN, PA.—The Penn El. Ser. Co., a subsidiary of the Citizens' Lt., Ht. & Pwr. Co., of Johnstown, has begun work on the erection of a transmission line from Hooversville to the new town of Cairnbrook, a distance of about 10 miles. The company will furnish electricity for several industries there as well as for domestic and commercial purposes.

KITTANNING, PA.—At an election held Aug. 25 the proposal to issue $112,000 in bonds for the installation of an electric-light plant and water-works system was carried.

PHILADELPHIA, PA.—The contract for the construction of a one-story addition (67 ft. by 88 ft.) to the power house of the Girard estate at Twentieth Street and Oregon Avenue has been awarded to Doak & Co., of Philadelphia.

PHILADELPHIA, PA.—The Pike County Lt. & Pwr. Co., which was organized by Philadelphia interests to acquire lighting and power companies in Pennsylvania, has secured options on the Milford Township El. Co., the Milford El. Co. and the Westfall El. Co. The office of the company is in the Land Title Building, Philadelphia.

PITTSBURGH, PA.—The contract for installing 35 ornamental lamps standards, carrying a 2000-cp inverted arc lamp, maintained by underground wires, on Oliver Street, has been awarded to the Duquesne Lt. Co. Robert Swan is director of public service.

PITTSBURGH, PA.—The West Penn El. Co. has secured the contract for furnishing electricity to several mines on the line of the Montour railroad, which include the McDonald, Bishop, Thompsonville and Hills and the Henderson Coal Co.'s mine at McPherson's Mills. At the last named mine 3 miles of wire will be erected and 1100 hp will be supplied. The company recently secured the contract for furnishing power for the Pittsburgh-Buffalo Co.'s Hazel mine, at Cannonsburg.

ATLANTIC CITY, N. J.—The Atlantic City El. Co. has been granted a permit to erect a power house, 52 ft. by 102 ft. to cost about $9,000. Bids, it is understood, will soon be asked for.

BUTLER, N. J.—Bids will be received by George J. Fritz, borough clerk, until Sept. 14 for construction of municipal electric-light plant, including power station, gas producers, electric equipment, etc. Plans are on file in the office of Runyon & Carey, consulting engineers, 845 Broad Street, Newark, N. J.

GLOUCESTER, N. J.—The installation of an electric-light plant in connection with the municipal water-works system is reported to be under consideration.

LAMBERTVILLE, N. J.—An order has been issued by Vice-Chancellor Backes directing the sale of the property of the Lambertville Ht., Lt. & Pwr. Co., free from encumbrances, amounting to $80,000.

ROSELAND, N. J.—The Borough Council has instructed George A. Flammer, chairman of the lighting committee, to request the Public Ser. El. Co., of Newark, to extend its transmission lines down Eagle Rock Avenue and over Passaic Avenue. Street lamps cannot be placed this year, as the appropriation has been exhausted. Provision will be made for street-lighting next year if the wires are extended.

VINELAND, N. J.—Plans are being prepared by George S. Drew, state architect, State House, Trenton, for a power house for the New Jersey State Home for Feebleminded Women, to cost about $30,000.

BECKLEY, W. VA.—Tentative arrangements are under way by parties interested in the Beckley Utilities Co., recently organized by G. C. Hedrick and others, for securing franchises and installing a water-works system and an electric light and power plant in Beckley.

BUCKHANNON, W. VA.—The Buckhannon Lt. & Wtr. Co. will install within the next 30 days one 1,000,000-gal. centrifugal pump directly connected to a 80-hp, 2300-volt motor, both manufactured by the Allis-Chalmers Co. The company has just completed its new power plant and a complete lighting system. J. G. Mayfield is general manager.

CAMERON, W. VA.—Application has been made by J. H. Peabody and P. R. Fagan to the Town Council for a franchise to construct and operate an electric-light plant in Cameron.

WOODSDALE, W. VA.—The town of Woodsdale has awarded the contract for the installation of a new street-lighting system to the Stratford El. Co. The contract calls for 60 lamps. Woodsdale has not a post office.

WEYER'S CAVE, VA.—The Weyer's Cave Lt. & Pwr. Co. expects to erect within the next three months 6 miles of electric distributing lines and to purchase material for same. L. E. Long is secretary and manager.

WASHINGTON, D. C.—Plans have been prepared by the C. O. Cooley Co., of Pittsburgh, Pa., for the construction of a power plant, refrigerating plant, boiler house and gas-producer plant, to be erected at First and M Streets, N. W., for the Chapin-Sacks Mfg. Co., to cost about $300,000.

WASHINGTON, D. C.—Plans have been prepared by Walter C. Allen, electrical engineer of the District of Columbia, for improvements to the lighting system on Pennsylvania Avenue southeast from the Capitol grounds to Anacostia Bridge, and in the area bounded by First and Seventh Streets and Pennsylvania and New York Avenues. The plans provide for replacing the arc lamps now in use with electric incandescent lamps.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Sept. 22 for furnishing at the various navy yards and naval stations the following supplies: Washington, D. C., Schedule 7254—200 iron boiler tubes (4 in. in diameter, 18 ft. long). Brooklyn, N. Y., Schedule 7271—3000 ft. four-conductor interior-communication cable, 225,000 ft. double, plain, flexible, insulated conductor, 1400 key sockets for ⅜-in. pipe, 300 fiber-lined, keyless sockets (⅛-in. cap), 9500 ft. 60,000-circ. mil, galvanized, soft-steel, leaded and armored twin-conductor wire. Schedule 7252—320 special porcelain supporting insulators. Schedule 7270—77,600 ft. rubber-insulated lighting and power wire, for 600 volts or less. Schedules 7257 and 7271—11,000 ft. galvanized, soft-steel, leaded and armored, interior-communication cable. Newport, R. I., Schedule 7237—Two bucket turbine cutting machines, length over all 6 ft., width 35 in. Norfolk, Va., Schedule 7239—Two 3½-in. by 3½-in. steering engines for steam steering only. Charleston, S. C., Schedule 7262—3100 lb. cold and soft-rolled sheathing copper. Brooklyn, N. Y., Schedule 7240—one continuous electric blueprinting machine to print tracings 42 in. wide. Washington, D. C., Schedule 7249—miscellaneous switch points, frogs and ground levers, miscellaneous steel rails and angle bars.

North Central

DETROIT, MICH.—Bids will be received by Van Leyen & Schilling, architects, 1151 Union Trust Building, Detroit, until Sept. 21 for the erection of a public school building in Wayne County.

DETROIT, MICH.—Bids will be received by Charles A. Gadd, secretary of the board of education, Detroit, until Sept. 8 for electric wiring for the Healy and Kennedy School Buildings, the Sylvester Street School Building and the building for the relief of the Fairbanks School.

FLINT, MICH.—The electric service of the Commonwealth Pwr. Co. will be extended into the country districts in Genesee County about Sept. 15, when a line to Fentonville, via Grand Blanc, will be opened, from the local plant of the company. Electricity will be supplied to the farmers along the line as well as in the villages of Grand Blanc and Fenton. The transmission line, which later will be extended to Long Lake, a summer resort, 14 miles from here, it is said, is a forerunner of an electric railway to be built by the Michigan Ry. Co. from Flint to Long Lake and Fenton.

KALAMAZOO, MICH.—The City Council, it is reported, is considering the question of furnishing electricity from the municipal electric plant for commercial lighting.

MUSKEGON, MICH.—Arrangements are being made by the Brunswick-Balke-Collender Co., of Muskegon, for the installation of an electric generating plant. The boilers are now being installed, and it is understood that contracts will be let for a 750-kw generator and engine. J. C. Shank, of Chicago, is general manager of the company's chain of plants.

POTTERVILLE, MICH.—A committee has been appointed by the Business Men's Association to investigate the question of installing an electric-lighting system in Potterville.

CANAL DOVER, OHIO.—Within the next three months the Board of Public Works expects to purchase equipment for a new street-lighting system. It is proposed to replace 200 metallic-flame-arc 4-amp lamps with the new (type C) nitrogen lamps. Homer Keppler is superintendent of construction.

CELINA, OHIO.—Within the next two months the Board of Public Works expects to purchase a coal-unloading device, consisting of a conveyor and crusher, for the municipal electric-light plant. A 208-kva generator and switchboard was recently installed. C. W. Howard is superintendent.

CINCINNATI, OHIO.—Owing to unsettled conditions due to the European war the new court house building commission has decided not to open bids for construction of new court house, as advertised to be opened on Sept. 1. Should any bids be received they will be returned unopened. James A. Green is president of commission.

CLEVELAND, OHIO.—The contract for construction of substation on Walworth Avenue for the municipal electric-light plant has been awarded to the C. N. Griffin Co., of Cleveland, at $33,700.

CLEVELAND, OHIO.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 22 for air washers, humidifiers, tempering coils, etc., in the United States post office, custom house and court house, at Cleveland, Ohio. For details see proposal columns.

CLEVELAND, OHIO.—The contract for the electrical work in the large factory and power house recently erected by Parish & Bingham Co., manufacturers of automobile frames and cold stampings, has been awarded to the F. M. Grant El. Co., of Cleveland. The main building is 900 ft. by 100 ft., with a traveling crane running the entire length. The installation consists of 600 lamp outlets, and a total of 700 hp will be required. Wires will be placed in iron conduits. Energy will be supplied at 440 volts for motors and at 110 volts for lamps. All motors will be equipped with safety-first switches and overload relays. The Grant company is also installing a complete conduit and wiring system for lamps, telephone, fire gongs, etc., in the new McKinley School Building in Lakewood.

DILLONVALE, OHIO.—The Public Service Commission has authorized the Sunnyside El. Co., a subsidiary of the American Gas & El. Co., 30 Church Street, New York, N. Y., to purchase the property and franchises of the Dillonville Ht., Lt., Pwr. & Wtr. Co. for $45,000. The Dillonvale company furnishes electricity in Dillonvale, Adena and Mount Pleasant. The Sunnyside company has also applied to the Public Service Commission for permission to purchase the property of the Barnesville Gas & El. Lt. Co. at Barnesville, and also the property of the Belmont Co., which distributes electricity throughout Belmont County, Ohio.

EATON, OHIO.—The Town Council has entered into a new contract for street-lighting with the Eaton Ltg. Co. for a period of seven years, under the terms of which the company agrees to replace the lamps now in use (of which there are 215), with tungsten incandescent lamps of higher candlepower. In the business section of the town 21 lamps of 100 cp will be erected and 80-cp lamps elsewhere.

FRANKLIN, OHIO.—In connection with the construction of cement sidewalks on the west side of the city the residents are asking that electric street lamps be installed at the same time.

HAMILTON, OHIO.—Investigations are being made by Joseph Meyers, director of public service, at the request of the town of Millville, with a view of extending the municipal electric-lighting service to that town to furnish electricity for street-lighting as well as for domestic purposes.

HICKSVILLE, OHIO.—The Hicksville and Edgerton electric-light plants have been consolidated under one management and will furnish electricity in a number of towns in this section, including Edon, Butler, St. Joe, Melbern, Blakeslee, Antwerp, Woodburn and Spencerville.

MOUNT VERNON, OHIO.—An ordinance is being prepared by the city solicitor providing for an issue of $45,000 in bonds for construction and equipment of a municipal electric-light plant, which will be submitted to the voters at the fall election.

SANDUSKY, OHIO.—The Municipal League has given notice that it will ask the Council to call an election to submit to the voters the proposal to establish a municipal electric-light plant. A bond issue of $200,000 will be required.

ZANESVILLE, OHIO.—A number of local business men are interested in a project to organize a company to establish an electric power plant to supply electricity to the manufacturing industries in this city. It is proposed to establish a large central station at the mouth of the Wagon Mines near Zanesville.

FLEMINGSBURG, KY.—The capital stock of the Flemingsburg Lt. & Ice Co. has been increased from $8,000 to $12,000.

FRANKFORT, KY.—The State Capitol Commission has directed Samuel Lykins, custodian, to investigate the cost of extending a cable from the power plant at the State Reformatory to the old Capitol, with a view of lighting the building with electricity from the power plant in the reformatory.

HENDERSON, KY.—Bids will be received by the city clerk of Henderson for construction of a new steel-frame boiler room, approximately 70 ft. by 90 ft., for the municipal electric-light station. For details see proposal columns. L. P. Hite is superintendent.

WHITESBURG, KY.—A company is being organized by K. U. Surman, representing the James Clark El. Co., to build an electric-light plant in Whitesburg.

MANSFIELD, ILL.—The Mansfield El. Co., it is reported, contemplates extending its high-tension transmission lines to the southwest of the city for the purpose of supplying electricity to farmers along the route. It is also proposed to light several villages from the Mansfield plant.

QUINCY, ILL.—Among the improvements contemplated by the Citizens' Water Works Co., of Quincy, and which have been authorized by the City Council, are the installation of one high-duty electrically driven pump, to cost about $7,500, and one low-duty electrically driven pump, to cost about $2,500. W. R. Gelston is superintendent.

STERLING, ILL.—The power plant of the Rock River Lt. & Pwr. Co. on Rock River in Sterling has been placed in operation. The plant has an output of 3000 hp and will supply electricity in Sterling and other nearby towns.

COLUMBUS, WIS.—A new 18-ft. by 72-in. boiler is being installed in the municipal electric-light plant.

LA CROSSE, WIS.—Within the next two months the Wisconsin Ry., Lt. & Pwr. Co., of La Crosse, expects to purchase two 300-kw generating units.

MENOMONIE FALLS, WIS.—In the next three months the Menomonie Falls El. Lt. Co. expects to install one 75-kw generator, a 150-hp oil engine and 150 meters.

MERCER, WIS.—Bids will be received by the school board of District No. 1 of the town of Mercer until Sept. 15 for construction of school building. Separate bids will be received at the same time for heating plant, plumbing and electric wiring. Henry Wildhagen, of Ashland, is architect. Plans may be seen at the office of the architect, Ashland, or at the office of F. G. Ball, of Mercer.

MILTON, WIS.—The Milton Wtr., Lt. & Pwr. Co. expects to purchase within the next six or eight months a carload of poles and 200 ft. of twin-laid lead-covered cable for street lamps. The village furnishes its own lamp-posts. J. H. Burdick is president.

SCHLEISINGERVILLE, WIS. — The Council is considering the question of installing a municipal electric-light plant, to cost about $6,000.

SPARTA, WIS.—Plans, it is reported, are being considered for extensions to the local electric-light system.

WAUKESHA, WIS.—Within the next 30 days the Waukesha Gas & El. Co. expects to purchase wire, arresters and line appliances to cost about $5,000; also within the next 12 months to purchase electrical appliances and supplies, including heating and cooking apparatus, vacuum cleaners, washing machines, wiring supplies, etc., amounting to approximately $12,000. The company has contracted with the Chain Belt Co., of Milwaukee, Wis., for a complete new coal-handling system, to be installed within the next three months. C. R. Stull is manager.

BALDWIN, MINN.—The electric plant of the Baldwin El. Lt. & Fuel Co. is reported to have been purchased by the C. Burkhardt Milling & El. Co., of Burkhardt, at $20,000.

LUVERNE, MINN.—Improvements to the municipal electric-light plant involving an expenditure of $20,000, it is reported, are contemplated.

NOPEMING, MINN.—Bids will be received by the State Board of Control, State Capitol Building, St. Paul, until Sept. 10 for construction of boiler house, connecting tunnels, chimney, boiler-house equipment, heating and plumbing, according to plans and specifications prepared by Holstead & Sullivan, of Duluth, Minn. Bids to be submitted separately on each part of the work.

ST. CLOUD, MINN.—Bids will be received by the State Board of Control, State Capitol Building, St. Paul, until Sept. 15 for construction of a ladies' dormitory at the State Normal School, St. Cloud, Minn., including general contract work, heating and ventilating, plumbing and electrical work, in accordance with plans and specifications furnished by C. H. Johnston, architect, Capital Bank Building, St. Paul. Bids to be submitted separately on each division of the work. Bids will also be received at the same place and time for power-plant equipment for the St. Cloud State Reformatory at St. Cloud, in accordance with plans and specifications prepared by the Charles L. Pillsbury Co., engineer, Metropolitan Life Building, Minneapolis. Plans and specifications for power house may be seen at the office of the superintendent of the St. Cloud State Reformatory, St. Cloud, Builders' Exchange in St. Paul and Minneapolis, and at the office of the engineers.

WORTHINGTON, MINN.—The contract for construction and erection of a 6600-volt (No. 6 copper wire) transmission line from Worthington to Round Lake has been awarded to the Sterling El. Co., of Minneapolis; also for one switchboard. The construction of other transmission lines is pending. W. H. Buchan is superintendent

ADEL, IA.—The property of the Adel Mill Co., including electric-lighting plant, was recently destroyed by fire, leaving the town without electrical or water service. The plant furnished electricity in Adel, Dallas Center and De Sota.

AURELIA, IA.—At an election held Aug. 17 the proposal to issue bonds for the construction of a municipal electric-light plant was carried. The cost of the system is estimater at $7,000.

CHARITON, IA.—The City Council has passed a resolution authorizing Mayor Seward to call a special election on Sept. 8 to submit to the voters the proposal to sell the municipal electric light and power plant to Edwin B. Perrigo, of Omaha, Neb., for $65,000.

DES MOINES, IA.—The State Railroad Commission has granted the Des Moines El. Co. a franchise to erect a transmission line from Des Moines to Oskaloosa with a branch to Knoxville. The cost of the line is estimated at $200,000. Intermediate towns will be supplied with electricity. The right-of-way for the line has already been secured.

LE MARS, IA.—The installation of a municipal electric-light plant and waterworks system in Le Mars is under consideration.

REINBECK, IA.—The local electric-light plant is reported to have been destroyed by fire recently.

RENWICK, IA.—Bonds for the installation of a municipal electric-light plant, it is reported, have been voted.

RIDGEWAY, IA.—The town of Ridgeway, it is reported, has voted to install a municipal electric-lighting system.

SHENANDOAH, IA.—The Council has decided to call an election to submit to the voters the proposal to issue bonds for the installation of a municipal electric-light plant. The cost of the system is estimated at $40,000.

SIOUX CITY, IA.—At an election held Aug. 19 in South Sioux City the proposal to install a municipal electric-light plant, to cost $10,000, was carried.

BUTLER, MO.—The City Council is contemplating extensions and improvements to the municipal electric-light plant and water-works system. Harper & Stiles, of Kansas City, Mo., are engineers.

KANSAS CITY, MO.—The Cowgill Garage & Lt. Co., of Kansas City, is preparing to build an electric-light plant, garage and opera house in Kansas City.

PILOT GROVE, MO.—The Zahiringer El. Lt. & Pwr. Co., it is reported, is contemplating the installation of an electric-light and power plant in Pilot Grove.

ST. LOUIS, MO.—The Improvement Associations of Jennings and Woodlawn, towns northwest of St. Louis, are considering the question of installing electric street-lighting systems in their towns.

LAKE PRESTON, S. D.—The Lake Preston Milling Co. has recently installed a steam engine and generator and also erected a transmission line to De Smet, a distance of 10 miles. The company expects to be ready to furnish electricity in De Smet about Oct. 1. G. J. Ostroot is secretary and manager.

WESSINGTON SPRINGS, S. D.—At a special election held recently the proposal to issue $20,000 in bonds for the construction of a municipal electric-light plant was carried.

DE WITT, NEB.—Plans are being considered by the Council for the installation of a municipal electric-light plant to cost about $15,000.

EWING, NEB.—The Council is considering calling an election to submit to the voters the proposal to issue $18,000 in bonds for the installation of a municipal electric-light plant.

UEHLING, NEB.—Bids will be received until Sept. 8 by the city of Uehling for the construction of a municipal electric-light plant, city hall, etc. Plans may be obtained from V. L. Hollster, of Lincoln, Neb., consulting engineer, or from H. F. Meyer, village clerk, Uehling.

BUCKLIN, KAN.—At an election held recently the proposal to issue $16,000 in bonds for the purpose of taking over the plant of the Bucklin El. Lt. & Pwr. Co. was carried.

KANSAS CITY, KAN.—At an election held Aug. 25 the city commissioners were authorized to issue $650,000 in bonds for improvements and extensions to the municipal electric-light plant and water-works system. Of the proceeds $450,000 will be used for the lighting plant.

Southern States

HIGH POINT, N. C.—The North Carolina Pub. Ser. Co., of High Point, is planning to install an ornamental street-lighting system in the business district, consisting of 60 standards carrying five (60-watt) lamp clusters maintained by underground wires. The standards will be furnished by the Union Fdy. Co., of Anniston, Ala.

APOKA, FLA.—Application has been made to the Town Council by M. T. Anderson for a franchise to install an electric-light plant and water-works system.

JACKSONVILLE, FLA.—The Arlington Wtr. & El. Co., recently incorporated with a capital stock of $10,000, purposes to erect an electric-lighting system and to lay water mains in the Arlington Heights section. J. F. Zetsche is president.

LEESBURG, FLA.—Within the next two months the Leesburg Ice Co. expects to erect an addition to its power house and to install a 200-hp Skinner engine, a 125-kw General Electric generator and switchboard panel and a 250-gal. motor-driven centrifugal pump; also to extend its transmission lines and add several transformers and motors. Contracts have been placed for all equipment. J. Y. Clark is president.

FRIENDSHIP, TENN.—We are informed that the Business Men's League, as a corporation, is not interested in the installation of an electric-light plant or water-works system. A committee was appointed by the league to confer with the Town Council and recommend these improvements. The town will not be able to take up the matter at present. Reported in last issue that the Business Men's League was promoting plans to install an electric-light plant and water-works system. W. C. James is secretary of the league.

COLUMBIA, ALA.—The Columbia Pwr. Co., recently organized, with a capital stock of $16,000, is planning to build an electric plant on the Chattahoochee River in Columbia. R. D. Crawford, of Dothan, is interested in the company.

JACKSON, MISS.—The property of the Capital Lt. & Pwr. Co., of Jackson, was purchased at public sale by R. L. Benson, of Chicago, Ill., holder of $31,000 in bonds, for $5,000, subject to confirmation of the referee in bankruptcy.

CORNING, ARK.—The local electric-light plant, owned by George A. Pooser, was recently destroyed. A stock company, it is reported, is being organized to rebuild the plant.

MALVERN, ARK.—A large power plant to be operated by steam from the Arkansas Land & Lumber Co.'s sawmill is being erected by the Arkansas Pwr. Co. in Malvern. The company is also erecting a transmission line from here to Arkadelphia to supply electricity in that place.

BATON ROUGE, LA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 21 for alterations in the plumbing, lighting systems, etc., in the United States post office at Baton Rouge, La. For details see proposal columns.

McALESTER, OKLA.—At a special election held Aug. 25 the proposal to grant the Southwest Cities Utilities Co. a franchise was defeated.

CLARKSVILLE, TEX.—The City Council has entered into a contract with the Clarksville Lt. Co. for lighting the streets of the city. The contract provides for 50 lamps to be erected throughout the city. The city has been without street-lighting service for several years.

GONZALES, TEX.—The Gonzales Wtr. Pwr. Co. has awarded the contract for construction of a concrete dam (hollow type), 165 ft. long and 38 ft. wide, with 14-ft. head, in the Guadalupe River to H. C. Gass, of Houston, to cost about $20,000. The plans provide for the development of about 1000 hp of electrical power for transmission.

HOUSTON, TEX.—Plans and specifications are being prepared for the erection of a new building for the Western El. Co., to be erected at Commerce and Jackson Streets, to cost about $70,000.

NACOGDOCHES, TEX.—Within the next two months the City Light and Power Department expects to rebuild all of its transmission lines (work now under way) and to purchase 10 transformers; also to purchase within the next 30 days one 150-hp horizontal, tubular boiler (125 lb. to 150 lb. pressure). D. L. Thomas is secretary and treasurer.

PAMPA, TEX.—Preparations are being made by W. R. Beydler for the installation of an electric-lighting plant in Pampa, contract for which, it is understood, has been awarded to the Nunn El. Co., of Amarillo.

RUNGE, TEX.—The city of Runge is contemplating the installation of an electric-light plant and water-works system.

TEXAS CITY, TEX.—The Texas City El. Lt. & Wtr. Co. is contemplating an extension of about 3 miles to its street-railway system in Texas City between now and Jan. 1, 1915.

Pacific States

CENTRALIA, WASH.—The Independent El. Co., recently organized, has petitioned the County Commissioners for a franchise to construct and operate electric transmission lines on certain roads in Lewis County.

PORT ANGELES, WASH.—The Olympic Pwr. Co., of Port Angeles, expects to place a synchronous condenser in its Bremerton substation. Thomas T. Aldwell is president and general manager.

SPOKANE, WASH.—Plans are being considered for the installation of electroliers on Sprague Avenue through the business district.

SPOKANE, WASH.—The City Council has passed an ordinance providing for installing and maintaining an ornamental street-lighting system on First Avenue, between Bernard and Cedar Streets, for a period of ten years. It also appropriated $25,000 for automobile equipment for the street division of the Department of Public Works.

HOOD RIVER, ORE.—Water rights have been granted to August Guignard on the Hood River. These water rights are being held by Mr. Guignard in trust for the Farmers' Irrigation Co., a co-operative stock company of fruitgrowers, until arrangements can be made to issue bonds and build the plant. Present plans provide for the construction of a concrete dam across the river with an ultimate development of 2000 hp. About 20 miles of overhead-line material, it is estimated, will be required. R. A. Clanathan, of Hood River, is engineer in charge.

JUNCTION CITY, ORE.—Farmers in this section have petitioned the Oregon Pwr. Co., of Eugene, to extend its transmission lines into the farming section adjacent to this city. F. M. Hildreth is local manager.

OREGON CITY, ORE.—The Clackmas County Court has granted the Portland Ry., Lt. & Pwr. Co., of Portland, a franchise to erect and maintain an electric transmission line from Estacada to River Mill.

SUMMERVILLE, ORE.—The Klees El. Co., of Summerville, is extending its transmission lines over the northern part of Union County to supply electricity for lamps and motors to farmers in that district.

SALMON, IDAHO.—The Salmon River Lt. & Pwr. Co., recently incorporated, is planning to build a hydroelectric power plant at Salmon. The equipment will include one 1500-hp waterwheel (30-ft. head), one waterwheel governor, one 1000-kva, 60-cycle, alternating-current generator, with switchboard complete, and three 350-kva, 33,000-volt transformers. The present plans provide for one substation and 12 miles of overhead line. E. Riggs is general manager.

ST. ANTHONY, IDAHO.—Improvements involving an expenditure of about $100,000, it is reported, will be made to the local plant of the Utah Pwr. & Lt. Co. This work is being done in connection with a series of improvements to be made by the company in the development of the valley adjacent to St. Anthony.

ST. ANTHONY, IDAHO.—The Mesa Pwr. Co., recently incorporated with a capital stock of $500,000, has announced that it proposes to develop the water-power of the north fork of the Snake River, near St. Anthony. The power plant will be situated in the vicinity of Henry's Ford. The headquarters of the company will be in St. Anthony. Max Heber, Frank Kerr and Henry F. Kroyer are among the incorporators.

CORINNE, UTAH.—The installation of a small electric-light plant in connection with the water-works system to furnish electricity to light the town is under consideration by the city officials. Bids, it is understood, will soon be called for wiring the town, buildings, etc.

PLEASANT GROVE, UTAH.—The installation of a municipal electric-light plant in Pleasant Grove is under consideration.

HARLEM, MONT.—The City Council has granted R. J. Moore, of Glasgow, a franchise to construct and operate an electric light and power plant in Harlem.

LEWISTOWN, MONT.—The Polmar El. Co., recently incorporated, proposes to construct an electric plant near here and furnish electricity in this city and in Fergus County. Roy R. Polson, of Lewistown, is interested in the company.

GRAND JUNCTION, COL.—At the September election the proposal to establish a municipal electric plant will be submitted to the voters. If municipal ownership is adopted, two large hydroelectric propositions will be investigated. One site now in view would cost from $200,000 to $350,000 to develop.

JOHNSTOWN, COL.—W. C. Sterne, president of the Fort Lupton Lt. & Pwr. Co., of Fort Lupton, has been granted a franchise to supply electricity in Johnstown.

LITTLETON, COL.—The Arapahoe El. Lt. & Pwr. Co., of Littleton, is replacing all arc lamps with 100-watt tungsten lamps and also installing an ornamental street-lighting system on Main Street. O. F. Nats is superintendent.

TRINIDAD, COL.—Within the next six months the Trinidad El. Trans., Ry. & Gas Co. expects to erect 60 miles of transmission lines.

FALLON, NEV.—The Nevada Valleys Pwr. Co. has applied to the Board of Commissioners of Churchill County for a franchise to erect and maintain electric transmission lines over certain highways in the county.

WINNEMUCCA, NEV.—The Nevada Valleys Pwr. Co. has applied to the County Commissioners of Humboldt County for a franchise to erect electric transmission lines throughout Humboldt County. The head office of the company is in Reno. Edson F. Adams is president of the company, and F. J. Early is secretary.

Canada

CALGARY, ALTA.—R. A. Brown, City Hall, Calgary, city electrician, will have charge of the proposed improvements to the municipal electric-light plant.

LONDON, ONT.—Plans are being prepared by H. J. Glaubitz, general manager of the Hydro-Electric system of the city of London, for the installation of two waterwheels, turbine pumps and synchronous motors and other accessories at the Springbank pumping station. This machinery will not be installed until next spring.

NIAGARA FALLS, ONT.—Plans are being prepared by the Hydro-Electric Power Commission of Ontario for the construction of a large generating station at Queenston to utilize the waste waters of the Welland ship canal and 6000 cu. ft. of water of the Niagara River, not allotted by the Canadian authorities. The plant will be situated about 200 yards south of the Queenston Bridge and will have a generating capacity of 250,000 hp. The canal will be tapped at Port Robinson. Another transformer station will be erected at the top of the bank near Queenston Heights. The bulk of the energy will be transmitted to the Hydro distributing plant at Falls View. The plan to build a plant at the Whirlpool has been abandoned.

MONTREAL, QUE.—Surveys are being made by the Board of Commissioners for the installation of 200 lamp standards, for which it is understood that tenders will be called in the immediate future.

Miscellaneous

CORDOVA, ALASKA.—The Council has granted Harry H. Knox a franchise to construct and operate an electric-light plant in Cordova.

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until Sept. 14 for furnishing motor buses. General information relating to the bids may be obtained at the above office. Major F. C. Boggs is general purchasing officer.

SAN JUAN, P. R.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 10, for construction of radio building and chief operator's quarters, plans and specifications for which may be obtained on application to the bureau.

New Incorporations

HANOVER, IND.—The Hanover Lt. & Pwr. Co. has been incorporated with a capital stock of $2,500 to supply electricity for lamps and motors. The directors are James C. Reed, P. Sample and I. A. Reed.

NEW YORK, N. Y.—The Northern New York Pwr. Co., of New York, has been incorporated with a capital stock of $500,000 by D. P. Ayars, of Wilkes-Barre, Pa.; G. H. Hees, of Toronto, Can., and W. R. Hees, of New York, N. Y. The company purposes to supply electricity for lamps, heaters and motors.

SIDNEY, OHIO.—The Sidney El. Co. has been chartered with a capital stock of $10,000 by Charles F. Chapman, Edward W. Kelsey, Jr., H. W. Isenberg, B. Boggs and M. E. Nye.

RIVERSIDE, WASH.—The Mutual El. Lt. & Pwr. Co. has been incorporated by O. R. McKinney, A. Benson, George Richter, Charles Gray and Leonard A. Westbo, Puyallup, Wash.

Directory of Electrical Associations

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, H. O. Hanson, Mobile Gas Co., Mobile, Ala.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

AMERICAN ELECTRIC RAILWAY ACCOUNTANTS' ASSOCIATION. Secretary-treasurer, E. B. Burritt, 29 West 39th St., New York.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Secretary, E. B. Burritt, 29 West 39th St., New York. Annual convention, Atlantic City, N. J., Oct. 12-16.

AMERICAN ELECTRIC RAILWAY ENGINEERING ASSOCIATION. Secretary, E. B. Burritt, 29 West 39th St., New York. Annual convention, Atlantic City, N. J., Oct. 12-16.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa. Fall meeting, Niagara Falls, N. Y., Oct. 1-3.

AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION. Secretary, Dr. J. Willard Travell, 27 East 11th St., New York.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Secretary, Eugene W. Stern, 101 Park Ave., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country.

AMERICAN PHYSICAL SOCIETY. Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS. Secretary, William H. Ross, 154 Nassau St., New York City.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. Secretary, Edwin A. Scott, 29 West 39th St., New York.

AMERICAN WATER WORKS ASSOCIATION. Secretary, J. M. Diven, 47 State St., Troy, N. Y.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary, W. J. Tharp, Little Rock, Ark.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, Geo. C. Holberton, Pacific Gas & Electric Co., San Francisco, Cal. Annual meeting, Sept. 14, Greenbrier Hotel, White Sulphur Springs, W. Va.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, W. T. Snyder, McKeesport, Pa. Annual convention, Cleveland, Ohio, Sept. 14-19.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Jos. A. Andreucetti, Chicago & Northwestern Railway, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, 112 West Adams St., Chicago.

CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, W. S. Hanbridge, 1408 Merchants' National Bank Building, Los Angeles, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary-treasurer, Allan Sullivan, 610 Confederation Life Bldg., Toronto, Can.

COLORADO ELECTRIC CLUB. Secretary, C. F. Oehlmann. Meets every Thursday at Albany Hotel, Denver, Col.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, T. F. Kennedy, 900 15th St., Denver, Col.

COMMERCIAL SECTION, N. E. L. A. Secretary, J. F. Becker, 1170 Broadway, N. Y.

EASTERN NEW YORK SECTION, N. E. L. A. Secretary, C. S. Van Dyck, Schenectady, N. Y.

ELECTRIC CLUB OF CHICAGO. Secretary, Fred M. Rosseland, Monadnock Block, Chicago. Meets every Thursday noon at Hotel Sherman.

ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER BOSTON. Secretary, R. S. Hale, 39 Boylston St., Boston.

ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS. Secretary, H. D. Temple, 30 Foster St., Worcester, Mass.

ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE. Secretary, Geo. W. Russel, Jr., 25 West 42d St., New York.

ELECTRICAL CONTRACTORS' ASSOCIATION OF THE CITY OF CHICAGO. Secretary, M. N. Blumenthal, 179 West Washington St. Meets at noon on the second and fourth Wednesday of each month at 424 South Wabash Ave.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, A. J. Burns, 318 West Tenth St., Kansas City, Mo.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN. Secretary, Albert Petermann, 626 Lloyd St., Milwaukee, Wis.

ELECTRICAL CREDIT ASSOCIATION OF CHICAGO. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago.

ELECTRICAL CREDIT ASSOCIATION OF PHILADELPHIA. Secretary, John W. Crum, 1324 Land Title Building, Philadelphia, Pa.

ELECTRICAL SALESMEN'S ASSOCIATION. Secretary, Francis Raymond, 125 Michigan Ave., Chicago, Ill.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill. Quarterly meeting, Niagara Falls, Can., Sept. 9-11.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, Harding Building, 34 Ellis St., San Francisco, Cal. Meeting, San Francisco, second Thursday of each month.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Executive secretary, A. Jackson Marshall, 29 West 39th St., N. Y. Sections in New York, New England, Chicago, Philadelphia, Washington and Los Angeles. Annual convention, Philadelphia, Oct. 19-21.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin 29 West 39th St., New York.

FARADAY ELECTRICAL ASSOCIATION. Secretary, W. J. Collins, 1129 Masonic Temple, Chicago. Meets at noon on the first and third Wednesday of each month at Planters' Hotel.

FRANKLIN INSTITUTE. Secretary, Dr. R. B. Owens, Philadelphia, Pa.

GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA. Secretary-treasurer, Prof. H. V. Bozell, Norman, Okla.

GEORGIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. M. Clayton, Atlanta, Ga.

HYDROELECTRIC SECTION, N. E. L. A. Secretary, S. A. Sewall, 29 West 39th St., N. Y.

ILLINOIS STATE ELECTRICAL ASSOCIATION. Secretary, H. E. Chubbuck, Peoria, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, J. D. Israel, Engineering Societies Building, 29 West 39th St., New York. Sections in New York, New England, Philadelphia, Chicago and Pittsburgh. Annual meeting, Cleveland, Ohio, Sept. 21, 1914.

INDEPENDENT ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER NEW YORK. Secretary, A. Newburger, 1153 Myrtle Ave., Brooklyn, N. Y.

INDEPENDENT TELEPHONE ASSOCIATION OF AMERICA. Secretary, W. S. Vivian, Grand Rapids, Mich.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donahue, Lafayette, Ind.

INDIANA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, George Skilman, Indianapolis, Ind.

INSTITUTE OF OPERATING ENGINEERS. Secretary, L. Houmiller, 29 West 39th St., New York.

INSTITUTE OF RADIO ENGINEERS. Secretary, E. J. Simon, 71 Broadway, New York.

INTERNAL COMBUSTION ENGINEERS' ASSOCIATION. President, Charles Kratsch, 416 West Indiana St., Chicago. Meeting second Friday of each month at Lewis Institute.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex. Annual meeting, Atlantic City, N. J., Sept. 15-18.

INTERNATIONAL ELECTRICAL CONGRESS. Secretary-treasurer, Preston S. Millar, 80th St. and East End Ave., New York. Congress, San Francisco, Sept. 13-18, 1915.

INTERNATIONAL ENGINEERING CONGRESS. Secretary-treasurer, W. A. Cattell, Foxcroft Building, San Francisco, Cal. Congress, San Francisco, September, 1915.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England. Meeting at San Francisco, Sept. 9-11, 1915.

IOWA ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary, W. H. Thomson, Des Moines, Ia.

IOWA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. T. Humphrey, Waterloo, Ia.

IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, H. E. Weeks, Davenport, Ia.

JOVIAN ORDER. Jupiter (president), W. N. Matthews, St. Louis, Mo.; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo. Annual congress, St. Louis, Mo., Oct. 14-16.

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Secretary-treasurer, Ivor Thomas, 237 South Main St., Wichita, Kan. Annual meeting Oct. 22-24.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. J. Ziegler, 227 Bourbon St. Meeting every Wednesday, Audubon Building, New Orleans.

MAINE ELECTRIC ASSOCIATION. Secretary-treasurer, Walter S. Wyman, Waterville, Maine.

MICHIGAN ELECTRIC ASSOCIATION. Affiliated with N. E. L. A. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

MINNESOTA ELECTRIC ASSOCIATION. Secretary-treasurer, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated with the National Electric Light Association. Secretary-treasurer, H. F. Wheeler, Hattiesburg, Miss. Next annual meeting, Hattiesburg, April 12-14, 1915.

MISSOURI ELECTRIC, GAS, STREET RAILWAY AND WATER WORKS ASSOCIATION. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, Wm. L. Smith, Concord, Mass.

NATIONAL DISTRICT HEATING ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, Engineering Societies Building, 33 West 39th St., New York.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Building, Chicago.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass. Open meeting, New York, March, 1915.

NATIONAL INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, J. B. Earle, Waco, Tex.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, S. J. Bell, David City, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 60 State St., Boston, Mass.

NEW ENGLAND SECTION, ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Secretary, L. L. Edgar, 39 Boylston St., Boston, Mass.

NEW ENGLAND STREET RAILWAY CLUB. Secretary, H. A. Faulkner, 12 Pearl St., Boston, Mass. Meets last Thursday of each month.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. E. Bursiel, 149 Tremont St., Boston, Mass.

NEW ORLEANS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, S. J. Stewart, 212 Carondelet St., New Orleans, La. Meetings, second and fourth Tuesday of each month.

NEW YORK ELECTRIC RAILWAY ASSOCIATION. Secretary, Charles C. Dietz, 239 West 39th St., New York.

NEW YORK ELECTRICAL CREDIT ASSOCIATION. Affiliated with the National Electrical Credit Association. Secretary, Franz Neilson, 80 Wall St., New York.

NEW YORK ELECTRICAL SOCIETY. Secretary, G. H. Guy, 33 West 39th St., New York.

NORTHWEST SECTION, N. E. L. A. Secretary, N. W. Brockett, Pioneer Building, Seattle, Wash.

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PENNSYLVANIA ELECTRIC ASSOCIATION (State Section N. E. L. A.). Secretary-treasurer, S. C. Pohe, Bloomsburg, Pa. Annual meeting, Eagle's Mere, Pa., Sept. 8-11.

RAILWAY SIGNAL ASSOCIATION. Secretary-treasurer, C. E. Rosenberg, Times Building, Bethlehem, Pa.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. General manager, J. M. Wakeman, 29 West 39th St., New York.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

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SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

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WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 76 West Monroe St., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, 1410 First National Bank Bldg., Milwaukee, Wis.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED AUG. 25, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,108,145. ELECTROPLATING APPARATUS; John T. Daniels, Newark, N. J. App. filed May 10, 1913. Automatic dipping machine.

1,108,147. TELEGRAPHY; P. B. Delany, South Orange, N. J. App. filed Jan. 18, 1909. Chemical tape receiver.

1,108,148. TELEGRAPHY; P. B. Delany, South Orange, N. J. App. filed Jan. 18, 1909. Automatic chemical dot-and-dash recording.

1,108,149. ELECTRO-PNEUMATIC BRAKE-VALVE; E. H. Dewson, New York, N. Y. App. filed Oct. 9, 1908. With manually operable handles.

1,108,165. CONNECTOR; C. E. Godley, Detroit, Mich. App. filed March 9, 1914. For electric head-lamps, etc.

1,108,166. MOISTURE-PROOF TELEPHONE SET; C. E. Hague, Rochester, N. Y. App. filed May 25, 1910. Polarized ringer.

1,108,190. ELECTRICAL DISPLAY DEVICE; H. A. Kunitz, Pittsburgh, Pa. App. filed May 19, 1911. Rotatable light tubes.

1,108,194. COIN-CONTROLLED AUTOMATIC TELEPHONE-EXCHANGE SYSTEM; W. W. Leach, Chicago, Ill. App. filed Nov. 1, 1906. Combination calling and called line.

1,108,195. TROLLEY; W. M. Learned, Los Angeles, Cal. App. filed April 21, 1913. Double wheels.

1,108,235. METHOD OF TREATING ALLOY-STEEL SCRAP; P. P. Reese and E. L. Diehl, Munhall, Pa. App. filed Feb. 7, 1911. Electric heat treatment.

1,108,253. SYSTEM OF REMOTE CONTROL; W. M. Scott, Philadelphia, Pa. App. filed March 8, 1907. Circuit-breaker.

1,108,254. SYSTEM OF REMOTE CONTROL; W. M. Scott, Philadelphia, Pa. App. filed Oct. 7, 1907. Motor-controlled.

1,108,259. FITTING FOR ELECTRICAL CONDUITS; K. Sixma, Brooklyn, N. Y. App. filed Sept. 3, 1913. Sectional body.

1,108,305. TELEPHONE SIGNAL APPARATUS; D. D. Wright, San Francisco, Cal. App. filed Nov. 27, 1912. Automatic code work.

1,108,320. ELECTRIC-CURRENT-CONTROLLING APPARATUS; A. E. Burden, Indianapolis, Ind. App. filed May 10, 1913. Cumulative windings.

1,108,350. ELECTRIC CONDUCTOR; F. Färber, Dortmund, Germany. App. filed Dec. 2, 1913. For safety lamps, etc.

1,108,359. ELECTRIC SWITCH; M. Guett, Hartford, Conn. App. filed Jan. 2, 1913. Panelboard push-button.

1,108,383. TELEPHONE EXCHANGE SYSTEM; F. R. McBerty, New Rochelle, N. Y. App. filed Dec. 4, 1909. Test circuit selector.

1,108,394. TROLLEY GUARD; R. L. Queen, Millville, N. J. App. filed July 10, 1913. Hinged sides.

1,108,401. ELECTRIC TEST METER; G. A. Scheeffer, Indianapolis, Ind. App. filed Oct. 21, 1910. Controllable resistance.

1,108,410. ELECTROPLATING APPARATUS; E. B. Stone, New Britain, Conn. App. filed Dec. 9, 1913. Vat and dipping carrier.

1,108,439. MOTOR CONTROLLER; A. J. Horton, White Plains, N. Y. App. filed May 4, 1908. Adjustable speed controller.

1,108,442. MAGNETO ARMATURE; D. B. Hughes, New York, N. Y. App. filed May 10, 1912. Two-part non-magnetic casing.

1,108,453. LIGHTING FIXTURE; G. A. Macbeth, Pittsburgh, Pa. App. filed Feb. 15, 1913. Canopy and shade-holder.

1,108,470. ELECTRO-PNEUMATIC PRESSURE CONTROL; E. K. Parker, Santa Barbara, Cal. App. filed Aug. 12, 1912. Locking valve.

1,108,482. TELEPHONE SYSTEM; C. S. Winston, Chicago, Ill. App. filed Sept. 9, 1912. Selector switch.

1,108,516. RATCHET MECHANISM FOR ELECTRIC SWITCHES; J. G. Peterson, Jersey City, N. J. App. filed March 30, 1914. Base construction.

1,108,529. TELEGRAPH SYSTEM; C. R. Underhill, Providence, R. I. App. filed Aug. 25, 1904. Receiving instrument. Forty-six claims.

1,108,545. TELEGRAPH APPARATUS; G. P. Blessing, Seattle, Wash. App. filed Aug. 18, 1903. Relay with locking arm.

1,108,547. SOCKET SHELL; T. A. C. Both, Malden, Mass. App. filed Aug. 7, 1912. Insulating lining.

1,108,552, 1,108,553 and 1,108,554. TOASTERS; L. G. Copeman, Flint, Mich. Apps. filed June 13 and Dec. 13, 1913. Electric grid resistance and frame constructions.

1,108,563. MOTOR CONTROLLER; C. T. Evans, Milwaukee, Wis. App. filed May 14, 1910. Electro-responsive protective means.

1,108,568. DYNAMO-ELECTRIC MACHINE; V. A. Fynn, St. Louis, Mo. App. filed June 15, 1912. Windings on slotted members.

1,108,584. TRAIN-CONTROLLING MECHANISM; F. T. Jones, Baltimore, Md. App. filed Jan. 12, 1912. Block system with insulated track section.

1,108,605. AUTOMATIC SECTIONALIZING SWITCH; J. E. Motony, Schenectady, N. Y. App. filed Sept. 11, 1909. Locking toggle.

1,108,641. OPERATING MEANS FOR AN ELECTRIC-LAMP SWITCH; A. J. Tizley, New York, N. Y. App. filed May 25, 1914. Rotating sleeve.

1,108,674. TERMINAL CONNECTOR FOR SPARK PLUGS; C. W. Beck, Rockville Center, N. Y. App. filed Aug. 15, 1910. Inclosing sleeve.

1,108,678. LAMP-SOCKET CASING; R. B. Benjamin, Chicago, Ill. App. filed March 1, 1912. Interlock.

1,108,679. SUSPENSION FITTINGS; R. B. Benjamin, Chicago, Ill. App. filed April 1, 1913. For conduit-system wiring.

1,108,686. ELECTRO-THERAPEUTIC FLUID ELECTRODE; H. Bonis, Listowel, Canada. Porous terminal.

1,108,739. ELECTRICAL IGNITING DEVICE FOR INTERNAL COMBUSTION ENGINE; E. Gassmann, Brooklyn, N. Y. App. filed Aug. 6, 1913. Regulating device.

1,108,745. SYSTEM OF PHASE TRANSFORMATION; F. C. Green, Pittsfield, Mass. App. filed Nov. 21, 1911. Three-phase delta and Y connection.

1,108,746. MEANS FOR PREVENTING CONDENSATION OF MOISTURE IN TRANSFORMER TANKS; F. C. Green, Pittsfield, Mass. App. filed Nov. 2, 1913. Electrically heated fluid submersion.

1,108,750. COMBINED ALARM AND ELECTRIC-LIGHT SWITCH; J. G. Harrison, Goldfield, Col. App. filed March 26, 1912. For window and door contact.

1,108,753. FIRE ALARM; F. Herbeck, Athol, Mass. App. filed April 7, 1913. Annunciator construction.

1,108,782. ELECTRIC SIGNALING DEVICE FOR ELEVATORS; F. S. Payne, Boston, Mass. App. filed Oct. 17, 1904. (Forty-three claims.)

1,108,847. RINGER AND SECRET SERVICE DEVICE; F. G. and C. A. Neff, Davey, Neb. App. filed June 2, 1909. Telephone system.

1,108,872. MAGNETO-GENERATOR; R. G. Kirchner, Detroit, Mich. App. filed March 8, 1913. For ignition systems, etc.